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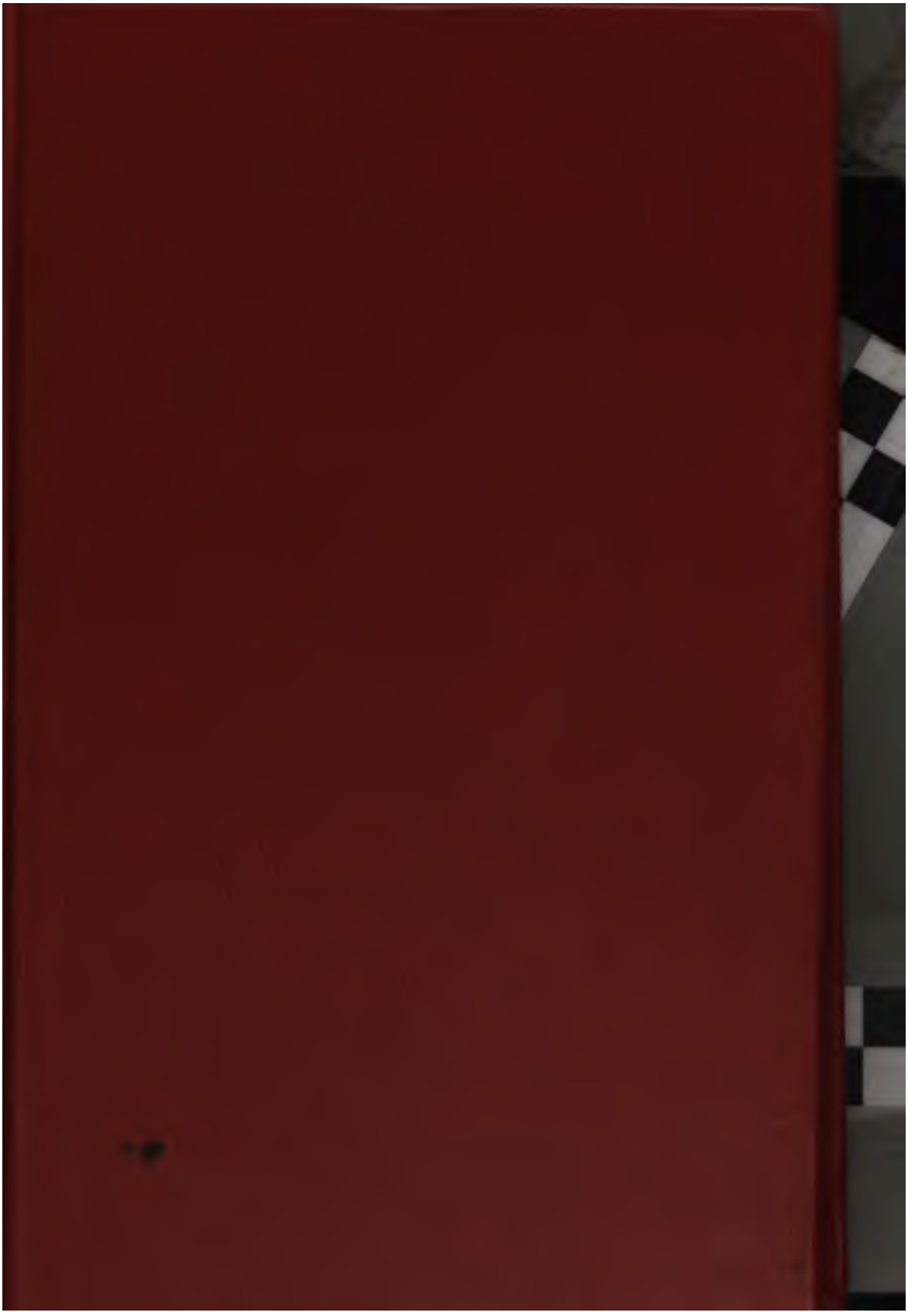

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Paper Manufacturing in the United States

DAM OF THE RITTENHOUSE MILL IN GERMANTOWN, PENN.
Site of the First Paper-Mill in the United States, 1690

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PREFACE

MANY books have been written concerning the purely technical sides of paper-making and much about the origin and history of the craft among the peoples of the old world. Also there have been considerable accounts of special features of it in this country; descriptions of individual mills; sketches of manufacturers, inventors and scientists; considerations of the introduction and improvement of new methods, new materials and new machinery and their influence; records of organizations, and so on. All this latter, however—though wholly admirable, interesting and valuable in itself—has been of a desultory and disconnected character: mainly chapters in books, magazines and newspapers; papers read before business associations, conventions and societies; addresses and discussions in legislative bodies, and essays and treatises in scientific periodicals.

This History covers the field differently. It is the only attempt that has been made to bring into one complete, compact narrative all the material facts relating to the industry and to present in an exhaustive and comprehensive manner, on the purely historical side, the annals of this branch of American manufacturing, from the erecting of the first little mill in Philadelphia, in 1690, to the opening years of the twentieth century. What has been done in this way for coal-mining, agriculture, many branches of manufacturing, oil production, the iron and steel industries and other American industrial activities has been here attempted for paper-making.

Gathering material for this History has occupied much of the time of the author for several years past, in conjunction with research along other historical lines. It is confidently believed that, in the preparation of the work, the ground has been covered broadly and soundly, con-

sidering the limitations of the subject and the scanty sources of information. The extent of the reading and investigation undertaken therewith is, in a measure, indicated by the authorities consulted, references to which have been copiously given. In addition, much has been derived from the personal knowledge of individuals who have been active in the industry in contemporaneous times.

Short-comings and errors exist in the work. No one can be more conscious of that than the author. Such is an unfortunate but an inevitable concomitant of a compilation of this sort, dependent, as it is, for its subject-matter, upon records that, in the remote past most notably, are meagre and often unreliable and contradictory. It is hoped, however, that any errancy of that kind may not materially detract from the interest of the work as a narrative or from its historical value. If it shall have succeeded in preserving in enduring form the otherwise fugitive records of one of the great industries of the United States, and if it may find acceptance as a not unworthy contribution to the literature of American industrial history, its main purpose will have been substantially accomplished.

LYMAN HORACE WEEKS.

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HISTORY OF PAPER-MANUFACTURING

CHAPTER ONE

BUILDING THE FIRST MILLS

THREE PIONEER ESTABLISHMENTS IN PENNSYLVANIA—RITTENHOUSE AND DE WEES IN GERMANTOWN AND WILLCOX IN CHESTER COUNTY—WILLIAM BRADFORD, THE PRINTER, A PROMOTER OF PAPER-MANUFACTURING—THE MILLS OF RITTENHOUSE AND WILLCOX BECAME PERMANENT AND SUCCESSFUL VENTURES

WHEN the American pioneers began their voyaging across the Atlantic to settle in the new world, in the seventeenth century, the business of manufacturing paper, as it is known in modern times, had not gained much headway in those parts of Europe whence they came. The age of papyrus and parchment was, it is true, practically at an end after five thousand years of history, but paper from rags was slow in coming into general use in place thereof.

Rag paper, first known in China about the beginning of the Christian era, was brought to Europe by the Saracens in the eighth century. Firmly established in Spain the process was there improved until, in the tenth and following centuries, Spanish paper became justly famous. Gradually artist workmen introduced their craft into France, Italy, Austria and Germany, and in those countries paper-manufacturing was common by the fourteenth century. England and Holland, destined to become great paper-manufacturing centers, were laggards in taking hold of the industry which was still considered to be very much of a mystery. In England, as late as 1690, there were few mills and the total product was less than

£25,000 in value. Holland had its first paper-mill only a few years prior to that date.

For other reasons also, paper-making was not an early occupation of the American colonists. Clearing the wilderness, trading with the Indians for furs, making farms, establishing towns and villages—these were the tasks that, in the beginning, pressed most upon the attention of the settlers. Their energies were, of necessity, directed to the engrossing work of providing shelter, food and clothing for themselves, to the exclusion of nearly all else, and primary needs were for implements and materials that should serve such ends. To a considerable extent the first pilgrims brought these things with them and then, in the immediate subsequent years, continued to import them from the old country. But Europe was too far distant in the days of the slow sailing vessel, and so, almost at the outset, arose the demand for home industrial enterprises of the simplest sort. Rivers furnished abundant water power and as soon as possible grist mills, lumber mills and fulling mills were built. Then iron was discovered in Virginia, Massachusetts, New Jersey and elsewhere, and mines were opened and furnaces started. Manufacturing in the first colonial century was practically confined to ship-building yards, a few rude iron furnaces, potasheries, fulling, grain and lumber mills, and tanneries.

Paper was not as yet a vital necessity. Newspapers did not exist until after 1700. There were few books except those brought from abroad. A printing press was set up in Cambridge, in the Massachusetts Bay colony in 1638, and others in Boston, New York and Philadelphia before the end of the century; but the printed output was small, less than one thousand books and pamphlets in sixty-two years, 1639-1700. Correspondence was not extensive and writing was largely left to the ministers and the officials. Our forefathers knew little of the manifold other uses and demands for paper that were to arise in the years to come. Their needs were altogether easily supplied by importing from England and Holland.

Even the starting of the first paper-mill, in 1690, does not seem to have been a result of any urgent call from the

community. Rather it came out of the combination of the small needs of a single printer in Philadelphia and the ambition of a newly-arrived German paper-maker; the printer and the paper-maker made an ideal partnership for establishing an infant industry in a field that had not yet been entered upon.

Prior to this time it is probable that few, if any, of the new Americans, who were mostly from England and Holland, knew much about paper-making practically. France and Germany were then leading paper-making countries and neither the French nor the Germans arrived in the colonies in any considerable numbers until the late part of the seventeenth century. Printing had grown to more substantial business importance in Boston than in any other colonial center, but even there the need of a paper supply independent of importation was not seriously felt; nor does it appear that paper-makers could have been found to run a mill even if one had been built.

The actual beginning of this new enterprise in Philadelphia was in September, 1690, when Robert Turner, William Bradford, Thomas Tresse and William Rittenhouse entered into an agreement with Samuel Carpenter for the lease of a tract of land of twenty acres on the banks of the Wissahickon creek for a site. The mill was built the same year, but the title to the land was not passed until February 12, 1706, by which time William Rittenhouse had become sole owner. By the terms of the lease, for nine hundred and ninety years from September 29, 1690, an annual rental of "five shillings sterling money of England" was to be paid. The mill stood in a little ravine on the banks of a stream, called Paper-Mill Run, that emptied into the Wissahickon creek, through Germantown, now a part of the city of Philadelphia, about two miles above the junction of the Wissahickon with the Schuylkill river.

Bradford was the moving spirit in this enterprise. He had come from England to Pennsylvania for the express purpose of setting up a press in Philadelphia. In London he had been a skillful printer and his professional abilities and forceful personality made him a man of prominence

and influence in the colony until a falling out with the authorities in 1693 led to his removal to New York where he became pre-eminently the first famous American printer and publisher. In 1686 he printed his first book, *Kalendarium Pennsylvaniense.* Once he was started in business other books and pamphlets came from his shop and soon he felt the inconvenience of depending for his printing upon such paper as he could bring over from Europe. His position placed him in intimate association with the leading men of the colony and no doubt his representations were influential in bringing the necessary monetary support to the undertaking.

Samuel Carpenter and Robert Turner were men of wealth, extensive land owners, and friends and advisers of William Penn. Thomas Tresse was a rich iron monger.

Willem or Wilhelm Ruddinghuysen, or Rittinghuysen, or Rittershausen—in English William Rittenhouse—was born in 1644 near the city of Mülheim on the river Ruhr, in the principality of Broich which lay between the river Rhine and Westphalia. It is believed that he was the son of George Rittershausen and Maria Hagershoffs. He belonged to a family of distinction, some of whose members were prominent in public and professional life. Several of his paternal ancestors were paper-makers in Germany and Holland and when he, in Amsterdam in 1678, took the oath of citizenship there, he subscribed himself, "Willem Ruddinghuysen, van Mülheim, papermaker." At one time he was in Arnheim, where he probably followed his trade. With his sons Nicholas (Claus) and Gerhard (Garrett), and his daughter Elizabeth, he came to America and was settled in Germantown, Penn., in 1688, though he may have been in the country before that date. He was a Mennonite, the first minister of that church in Germantown, and the first Mennonite bishop in America.[1]

In a modest way the mill was a success from the start. If it did not indeed "fill a long-felt want" it was at least promptly recognized as an interesting addition to the industrial life of the colony. Several early writers on Penn-

[1] Daniel K. Cassell: *A Genea-Biographical History of the Rittenhouse Family,* pp. 47-66.

sylvania referred to it. Pennsylvania's first poet, who wrote a metrical description of the colony, thus sang of the mill:

"The *German-Town,* of which I spoke before,
Which is, at least, in length one Mile and More,
Where *lives High-German* People, and *Low-Dutch,*
Whose Trade in weaving Linnin Cloth is much,
There grows the Flax, as also you may know.
That from the same they do divide the Tow;
Their Trade fits well within their Habitation,
We find Conveniences for their Occupation,
One Trade brings in imployment for another,
So that we may suppose each trade a Brother;
From Linnin Rags good Paper doth derive,
The First Trade keeps the second Trade alive:
Without the first the second cannot be,
Therefore since these two can so well agree,
Convenience doth approve to place them nigh,
One in the *German-Town,* 'tother hard by.
A Paper Mill near *German-Town* doth stand,
So that the Flax, which first springs from the Land,
First Flax, then Yarn, and then they must begin,
To weave the same, which they took pains to spin.
Also when on our backs it is well worn,
Some of the same remains Ragged and Torn;
Then of those Rags our paper it is made,
Which in process of time doth waste and fade;
So what comes from the Earth, appeareth plain,
The same in Time returns to Earth again." [2]

Another rhyming historian, writing about 1693, had these lines about Bradford and the paper-mill which had already become locally celebrated:

"Here dwelt a Printer, and, I find,
That he can both print books and bind;
He wants not paper, ink, nor skill,
He's owner of a paper-mill:
The paper-mill is here, hard by,
And makes good paper frequently.
But the printer, as I here tell,
Is gone unto New York to dwell.
No doubt but he will lay up bags
If he can get good store of rags.

[2] Richard Frame: *A Short Description of Pennsylvania.* Printed and sold by William Bradford in Philadelphia, 1692.

> Kind friends when thy old shift is rent
> Let it to th' paper mill be sent." [3]

A few years later an Englishman, writing in London concerning Pennsylvania, informed his readers that "all sorts of good *Paper* are made in the *German-Town*" [4]

As the practical man who alone was able to make the mill a success, William Rittenhouse ultimately became the sole owner. Turner disposed of his quarter interest in 1697, Tresse in 1701 and Bradford in 1704. Bradford depended upon the mill even after the removal of his printing business to New York; in 1697 he rented his part of the property to the Rittenhouses upon these terms:

> "That they the sd. W^m^ and Clause Rittenhouse shall pay and deliver to sd. William Bradford, his Executors or assigns or their order in Philadelphia ye full quantity of Seven Ream of printing paper, Two Ream of good writing paper and two Ream of blue paper, yearly and every year during ye sd. Term of Ten years. . . . . Also it is further Covenanted That during ye sd. Ten years ye sd. William and Clause Rittenhouse shall lett ye said Wm Bradford his Executors or Assigns have ye refusal of all ye printing paper that they make and he shall take ye same at Ten shillings pr. Ream, As also ye sd. Bradford shall have ye refusal of five Ream of writing paper and Thirty Ream of brown paper yearly and every year during ye sd. Term of Ten years, ye writing paper to be at 20^s^ and ye brown paper at 6^s^ pr. Ream." [5]

From this it is evident that Bradford was to receive annually, for his share of the mill, paper valued at £6 2*s*, that is, £61 for the term of ten years. In addition he also had a monopoly of the total product of the mill, which was actually all the paper made in the colonies, from September, 1697, to September, 1707.

In 1701 a freshet overran the banks of the Wissahickon

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[3] John Holme: *A True Relation of the Flourishing State of Pennsylvania.* Printed in the *Bulletin* [*Proceedings*] *of the Pennsylvania Historical Society,* I., No. 13, December, 1847, p. 172.

[4] Gabriel Thomas: *An Historical and Geographical Account of the Province and County of Pennsylvania and New Jersey in America.* London, 1698.

[5] *Pennsylvania Magazine of History and Biography,* XX., pp. 323-4.

THE THIRD RITTENHOUSE PAPER-MILL, BUILT PRIOR TO 1770.

and the paper-mill was swept away. The biographer of David Rittenhouse wrote regarding this that he had seen:

> "A paper in the handwriting of William Penn, and subscribed with his name, certifying that 'William Rittinghousen and Claus his son,' then 'part owners of the paper-mill near Germantown,' had recently sustained a very great loss by a violent and sudden flood, which carried away the said mill, with a considerable quantity of paper, materials and tools, with other things therein, whereby they were reduced to great distress; and therefore, recommending to such persons as should be disposed to lend them aid, to give the sufferers, 'relief and encouragement, in their needful and commendable employment' as they were 'desirous to set up the paper-mill again.' " [6]

In the following year a new mill was built a short distance from the site of the old one. At that time there was correspondence between Rittenhouse and Bradford concerning the transfer of the interest which the latter still held in the property, and in one of the letters the value of the materials saved from the wreck—lumber, iron and press—was stated at £15, 2*s*, 4*d*.

In 1706 William Rittenhouse deeded to his eldest son, Claus, a three-quarters interest in the mill and when he died intestate in 1708 the remaining quarter went to the same son. Claus Rittenhouse, who thus succeeded his father and became the second paper-mill proprietor in the colonies, was born in Holland in 1666, and died in Germantown in 1734. He continued to make writing, printing, brown and blue papers and pasteboard, supplying Bradford in New York and the home market in Germantown and Philadelphia. Upon his death the mill became the property of his eldest son, William, whose brother Matthias carried on the manufacturing there until 1730. In subsequent generations the building was reconstructed in whole or in part several times, but continued to be used as a paper-mill. Finally, however, it was converted into a cotton-mill. Later the site was incorporated in Philadelphia's great Fairmount park.

[6] William Barton: *Memoirs of the Life of David Rittenhouse*, p. 83.

In a later generation a third mill was built farther down on Paper Mill Run by the third William Rittenhouse. This building remained standing nearly to the close of the nineteenth century. Other mills were erected in the vicinity, one on Paper Mill Run, and two on the Wissahickon creek, all operated by members of the Rittenhouse family.

Neither the capacity of this mill nor the quantity of paper actually produced is known. All was handwork and each sheet was made separately. Several days were required for the finishing of a sheet of dry perfected paper.

> "A day's work for three men was four and a half reams of newspaper 20 x 30. So that there might have been made annually at the Rittenhouse mill from 1,200 to 1,500 reams of paper of all kinds but this is mere conjecture. Small as was its capacity, it was all important to the community at large, for the home supply of Pennsylvania was dependent upon it." [7]

Most if not all the paper made in the Rittenhouse mill was water-marked. The first water-mark used was the single word "Company." The second was a double; on one-half the sheet was the monogram WR and on the other half a shield, surmounted by a fleur-de-lis crest and bearing on its face a clover leaf—which was the town seal of Germantown—and beneath this the word "Pensilvania" in black letters. Another mark was K R, the initials of Klaas (Claus) Rittenhouse, and later was I R for Jacob Rittenhouse, grandson of the founder. These marks are on correspondence sheets, books and newspapers of the first half of the eighteenth century and later. William Bradford for his *New York Gazette,* established in November, 1725; and Andrew Bradford, his son, for his

EARLY WATER MARK OF THE RITTENHOUSE PAPER.

[7] Horatio Gates Jones: *Historical Sketch of the Rittenhouse Paper-Mill;* in *The Pennsylvania Magazine of History and Biography,* XX., p. 325.

American Weekly Mercury, of Philadelphia, established in December, 1719, the third newspaper in the American colonies, used Rittenhouse paper thus water-marked.

The second paper-mill in the colonies was a direct outgrowth of the Rittenhouse mill. It was built in 1710, by William De Wees, on the west side of the Wissahickon creek, in that part of Germantown then known as Crefield, not far from the Rittenhouse mill. William De Wees was a native of Holland, where he was born in 1677. He was brought to New York by his parents, Garrett Hendrick and Zytian De Wees, in 1688. His sister, Wilhelmina De Wees, in 1689, in the Reformed Church of New York, was married to Nicholas Rittenhuysen, who was then entered in the records as "a young man of Arnheim, living on the Delaware river." [8] This marriage was followed by the moving of the De Wees family to Germantown where William became an apprentice in the paper-mill of his brother-in-law's father, probably remaining there until he started his own mill. In 1713 he sold his mill, with a hundred acres of land, to Abraham Tunis, William Streeper, Claus Ruttinghuysen and John Gorgas for £145. In 1729 he entered into a business agre ment with Henry Antes, his son-in-law, the two to run a combination grist and paper-mill. This mill was also located in Germantown.

An indenture of February 20, 1731, describes the land purchased by De Wees in Crefield, in March, 1729, and the two bolting mills and mill house "built and erected, found and provided, at the joint and equal cost and charge of William De Wees and Henry Antes." The digging and making of the dams of the mill race and the providing and putting in the gears of the paper-mill were at the charge of De Wees. For the money and labor expended by Antes and cash £25, a one-half interest in the mills and ground was conveyed to him. It was also provided that the paper-mill should be served only by the over-plus of water after the needs of the grist mills had been first met.[9]

William De Wees parted with his mill before he died

[8] *New York Genealogical and Biographical Record,* X., p. 131.
[9] *Deed Book* F, 5, p. 197, Philadelphia Recorder's Office.

in 1745. His will, of November 22, 1744, did not mention it specifically although he bequeathed to his son Garrett his "dwelling house, grist-mill, land and plantation situate in Germantown with the buildings." But his son, Henry De Wees, succeeded him as a paper-maker. On a Philadelphia map of 1746, "Hy De Wees' Paper-mill" is located at that place. During the revolution Henry De Wees made cartridge paper for the continental army.

The first historian of American printing wrote that, as early as 1728, William De Wees and John Gorgas had a mill on the Wissahickon where "they manufactured an imitation of asses-skin paper for memorandum books, which was well executed." In support of this statement it was added that:

> "John Brighter, an aged paper-maker, who conducted a mill for more than half a century in Pennsylvania, and who gave this account, observed that this kind of paper was made of rotten stone, which is found in several places near and to the northward of Philadelphia, and that the method of cleaning this paper was to throw it into the fire for a short time when it was taken out perfectly fair." [10]

This description would seem to indicate an asbestos paper.

The same authority says that William De Wees, Jr., operated a paper-mill on the Wissahickon in 1736.[11] But there is no record of this in the history of the family, which, on the contrary, says that comparatively little is known about the younger William De Wees.[12]

Nearly forty years elapsed before the third Pennsylvania paper-mill came into existence. This was in the township of Concord, twenty miles from the city of Philadelphia, on the west branch of the Chester creek in that part of Chester county which afterward was Delaware county. Thomas Willcox, an Englishman, came to Concord in 1725, or earlier perhaps. In 1726 he and Thomas Brown built a mill-dam on the west branch, leasing land for the

[10] Isaiah Thomas: *The History of Printing in America*, I., p. 53.
[11] Isaiah Thomas: *The History of Printing in America*, I., p. 24.
[12] Mrs. Philip F. La Munyan: *The De Wees Family.*

purpose on agreement to pay "yearly & for every year ye sum of one shilling of current lawful money of this province." On this land, in August, 1729, he built a paper-mill and entered into a partnership with Brown to make and sell paper. He had learned paper-making before coming to America and the arrangement was that he should receive three-fifths of the profits of the joint undertaking in consideration of instructing Brown who, evidently knew nothing about the business.

THE WILLCOX IVY MILL, 1729.
Reproduced from Ashmead's *History of Delaware County, Penn.*

Little is known of the history of this mill during its first fifty years. The value placed upon the property is indicated by the fact that, in the beginning, Brown paid to Willcox £150 for his half interest, and that when he retired from active participation in the business, in 1732, he leased to Willcox his half interest in the land, mill and equipment, for a term of seven years, at a yearly rental of £13. Subsequently he reconveyed his interest to Willcox who thus became the sole owner. This and other adja-

cent property has remained in possession of descendants of Thomas Willcox to the present day.[13]

When Thomas Willcox died, in 1772, he was succeeded by his son, Mark, who had, in fact, been the pactical operator of the mill for some years previous. Mark Willcox retained ownership until his death, but, after 1808, he had his sons associated with him, the last surviving one inheriting the property and continuing the business until 1854. Attention has been called to the remarkable fact that at the time of the death of Mark Willcox, in 1827:

> "Two men, of two generations, father and son, had conducted the mill ninety-eight years. The ponderous machinery, however, of modern mills, silenced it long ago, but it still stands [1884] a silent relic of its early time. Its wheel has long since decayed; its stone gable is thickly covered with the venerable ivy-vine whose root came over the ocean, in 1718, from near the old Ivy Bridge in Devonshire." [14]

The first output of the Willcox mill is said to have been fullers' press board. Later, printing paper was made, some of it for Benjamin Franklin, who became a close friend of Willcox and much interested in his undertaking.

WATER MARK OF THE WILLCOX IVY MILLS PAPER.
Reproduced from Joseph Willcox's *Ivy Mills*, 1729-1866.

After 1775 the mill was devoted almost entirely to making government paper for the continental bills, loan certificates and bills of exchange. Ultimately, its product was principally banknote paper for the United States and various individual states, banks, foreign countries and private individuals. At the time of the revolution and before, the government authorities depended entirely upon this mill for paper for currency purposes and placed implicit confidence in it.

[13] Joseph Willcox: *The Ivy Mills*, 1729-1866.

[14] Henry Graham Ashmead: *History of Delaware County, Pennsylvania*, p. 494.

"When the old Colonies, much more than a century ago, found themselves obliged to issue paper money, the currency paper used by all of them was manufactured by Thomas Willcox, at Ivy Mills, and mostly printed in Philadelphia. No other currency paper was used upon the continent than that made at the old Ivy Mills. Many years later, in the necessities of the newly confederated states, the paper for all the continental currency was supplied from the same establishment. There was no other possessing experience in the manufacture, and during the revolutionary war, paper could not be imported. Again, in the war of 1812, the government was obliged to issue paper money, and again recourse was had to the old Ivy Mill to supply its necessities." [15]

[15] John Hill Martin: *History of Chester and Its Vicinity*, p. 233.

CHAPTER TWO

OTHER MILLS OF THE COLONIES

A Second Venture is Made by Bradford the Printer—First Mills are Established in Massachusetts, Maine, Connecticut, New York and Elsewhere—The Mills of the Ephrata German Community in Pennsylvania—Saur, Famous Printer of the First German Bible, Also Builds a Mill

As has already been shown in the preceding chapter three small mills alone represented the infant industry of paper-making until well into the second quarter of the eighteenth century. A growing need for paper existed, such as even importation was not able adequately to supply; but conditions were unfavorable to expansion of the business. Skilled workmen were scarce and rags were more scarce; it was difficult to procure even the simple tools needed, such as vats, presses and moulds, and they were expensive; the domestic market for paper was irregular, and altogether the cost of production was relatively so high that a better quality of imported paper could be sold for no more than that of domestic make. The industry, such as it was, continued to be merely local, responsive to and meeting local demands almost entirely, principally those of printers like the Bradfords and others.

William Bradford could never divest himself of the desire to own and operate a paper-mill as an adjunct to his press. He was one of the most energetic men of his time in Philadelphia and New York, shrewd, calculating, resourceful and dominating. Had he been of 1900 instead of 1700 he would have shone pre-eminently as one of our

modern hustlers. Within three months after his arrival in Philadelphia he had set up his press and printed an almanac, a big achievement for that time and under the conditions then prevailing. Instrumental in having the first American paper-mill built, partly to supply the needs of his printing establishment in Philadelphia, and in securing to himself a monopoly of the output of that mill, even after he had removed to New York city, his hunger for paper was only measurably appeased. Aside from the general need for writing paper, the press of his son, Andrew Bradford—who began printing in Philadelphia in 1710 and there started *The American Weekly Mercury* —added to the demand upon the limited domestic supply; both father and son continued to use all the paper that they could draw from Rittenhouse and De Wees but that was far from sufficient.

So it came about that, in 1724, he conceived the idea of securing a concession from the New York authorities, for starting a mill in that colony. On July 6 of that year he petitioned the general assembly "to admit him to bring in a bill to entitle him to the sole making of paper in the province." The bill was introduced and finally passed on July 14, when the assembly "ordered that Mr. Jansen do carry the Bill to the Council and desire their concurrence thereto."[16] In the council the proposed measure received short shrift, for the governor was not inclined to encourage any new colonial manufacturing if he could avoid it. The records state that, on July 16, this message was received by the council:

> "from the Assembly by Mr. Jansen dated the 14th Instant with the Bill entituled, An Act to Encourage William Bradford and his Assignes to make Paper and to prohibit all other persons from making the same in this Province during the space of fifteen years and Desiring the Concurrence of this Board thereto."

The bill was read the first time and ordered to a second reading. At the next meeting of the council, July 18, the bill was read the second time, referred to a committee, re-

[16] *Journal of the Votes and Proceedings of the General Assembly of the Colony of New York*, I., pp. 508-510.

ported back and then, "The question being put, Whether the said bill be read the Third time? It was carryed in the negative."[17] Such seems to have been the end of the first attempt to start a paper-mill in that colony.

However, a few years after, Bradford succeeded in having a mill, this time in Elizabethtown, N. J. By whom and when the mill was built and by whom first managed is not known.[18] It is said that Bradford bought it in 1728 in order to supply his newspaper, *The New York Gazette,* started in 1725, and that of his son, Andrew Bradford, in Philadelphia, the mill being very conveniently located between the two cities. How long he owned this mill cannot be said. That it was held by him in 1729 and was in existence as late as 1735 is shown by two newspaper advertisements of those dates:

> "An Indented Servant Man, named James Roberts, is Run away from *William Bradford's* Paper-Mill at Elizabeth Town in New Jersey. . . . He is a West-Country-man, has been about one year in the Country, and is a Paper-maker by Trade."[19]

> "On *Wednesday,* the 23 of April next, at the Paper-Mill in *Elizabeth-Town,* there will be sold at Publick Vendue to the highest Bidder, all sorts of Household Goods, Cattle, Horses, Hogs, Cart, Plows, Harrows with Iron Teeth, and other Utinsels: The Plantation adjoining to the said Mill will also be sold. . . ."[20]

Between 1639—when the first press was set up in Cambridge, Mass.—and 1728, there were thirty-five or possibly thirty-seven printers in the colonies, twenty-three of whom were in Boston, nine in Philadelphia and two in New York. The output in those years was three thousand and sixty-seven books, pamphlets and broadsides.[21] There were also six newspapers, all published weekly: *The Boston News-Letter, The Boston Gazette, The American Weekly Mercury* of Philadelphia, *The New-England Courant* of

[17] *Journal of the Legislative Council of the Colony of New York* pp. 512-514.

[18] Edwin F. Hatfield: *History of Elizabeth, N. J.,* p. 324.

[19] *The American Weekly Mercury,* Philadelphia, July 3 and 10, 1729.

[20] *The New York Gazette,* April 7, 1735.

[21] Charles Evans: *American Bibliography.*

Boston, *The New York Gazette,* and *The New-England Weekly Journal* of Boston. These had been in existence from one to twenty-four years, the oldest, *The Boston News-Letter,* having been established in 1704. The number of weekly issues of these newspapers prior to 1728 was about three thousand, making, with the books, pamphlets and broadsides, nearly eight thousand as the total number of imprints. The editions were not large in any instance, never, at the most, exceeding a few thousand copies, or of the pamphlets, probably only a few hundred.

Considering now the first quarter of the eighteenth century, the printers of Boston outnumbered those of the rest of the country two to one; four of the six American newspapers were published in Boston; two-thirds of the books and pamphlets of the period bore a Boston imprint. Eastern Massachusetts was easily the literary and typographic center. Yet, despite these facts, there was no paper-mill in this locality until after 1728. Why Philadelphia should have established this industry so far in advance of Boston, which would seem to have been earlier in need of it, is not clear. Perhaps the individual activity of William Bradford may have had much to do with that. Also the commercial connection of Boston with England was so intimate and well developed that importation was not inadequate to the domestic needs. Whatsoever may have been the reason, however, there were three mills in Pennsylvania and one in New Jersey before the first in New England.

Starting a paper-mill in those days was a serious affair. Even though the contemplated mill might be ever so insignificantly small and unimportant an ambitious man could not go out and invest his capital in site, water-power and building and proceed to work unrestrainedly. Papermaking was regarded as a sort of public utility—as indeed were other manufacturing industries—and it came under the watchful supervision of the public service commissions or trade commissions of that time, that is the great and general court, or the assembly, or the governor and council, as the authority might be in different colonies. Permission to engage in the business was a prerogative of the government and a monopoly, for an indicated term of

years, was asked for and generally included, if the permission was accorded at all. The grant was a ponderous, impressive document, elaborate with specifications and requirements. Such was the charter granted, upon petition, to several substantial citizens of Boston, in 1728, by the great and general court of the province of the Massachusetts Bay. The measure, passed on September 13 of that year, reads as follows in the legislative records:

An Act for the Encouragement of Making Paper.

"WHEREAS *the Making Paper within this Province will be of Public Benefit and Service; But inasmuch as the Erecting Mills for that purpose and providing Workmen and Materials for the Effecting that Undertaking will necessarily demand a considerable Disburse of Money for some time before any profit, or gain can arise there-from; And whereas* Daniel Henchman, Gillam Phillips, Benjamin Faneuil *and* Thomas Hancock, *together with* Henry Dering, *are willing & desirous to Undertake the Manufacturing Paper;* Wherefore, for the Promoting so beneficial a Design;

"Be it Enacted by His Excellency the Governour, Council and Representatives in General Court Assembled, and by the Authority of the same, That the sole Privilege and Benefit of making Paper within this Province shall be to the said *Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hancock* and *Henry Dering,* and to their Associates, for and during the Term of Ten Years from and after the Tenth Day of *December* next ensuing: provided the aforesaid *Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hancock* and *Henry Dering,* shall make or cause to be made within this Province, in the space of Twelve Months next after the Tenth Day of *December,* next, Two hundred Rheam of good Merchantable Brown Paper, and Printing Paper, Sixty Rheam thereof at least to be Printing Paper, and within the space of Twelve Months then next coming, shall cause to be made within this Province Fifty Rheam of good Merchantable Writing Paper, of equal goodness with the Paper commonly stampt with the *London* arms, over and above the aforesaid Two hundred Rheam of Brown Paper, and Printing Paper.

"AND *further,* That the aforesaid *Daniel Hench-*

man, Gillam Phillips, Benjamin Faneuil, and ***Thomas Hancock,*** together with ***Henry Dering,*** proceed and make Twenty-five Rheam of finer & better Writing Paper in this Province, as aforesaid, at or before the Tenth Day of *December,* which will be in the Year of Our Lord One thousand seven hundred & thirty-one and continue to make the Quantities and Species of paper before Enumerated in the aforesaid Two Years, and that they make or cause to be made within the space of Twelve Months, from and after the said Tenth of *December* 1731. Five hundred Rheam of good Merchantable Writing and Printing Paper, One

One of the Proprietors of the First Massachusetts Paper-Mill.

Reproduced from Oliver A. Roberts' *History of the Military Co. of the Massachusetts.*

hundred and fifty Rheam thereof at least to be Writing Paper, and continue to make the like Quantity of Five hundred Rheam, as aforesaid, every Year, for and during the remaining part of the said Ten Years; and if any person or persons shall make any Paper within this Province, without leave first had and obtained from the said *Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hancock* and *Henry Dering,* he or they so making the same shall pay *Twenty Shillings* for every Rheam of Paper Manufactured in this Province, as aforesaid; One half of the said Twenty Shillings to be to and for the Undertakers *Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hancock* and *Henry Dering,* and their Associates; the other half to the use of the Poor of the Town where the Paper shall be exposed to Sale, or brought and found, to be recovered by the said Undertakers, by Bill, Plaint or Information in any of His Majesties Courts of Record within the County, where the offence shall be committed, or before any Justice of the Peace in the same County, where the forfeiture shall not exceed Forty Shillings."[22]

This company of paper-makers, who thus initiated the business in the Massachusetts colony, was a sort of family affair. Daniel Henchman, the senior promoter, was a rich man, a book-binder, publisher and bookseller of Boston, and Thomas Hancock was his son-in-law. Hancock was also a bookseller and a stationer, becoming one of Boston's wealthiest merchants; and he was the uncle of the more famous John Hancock of the revolution period. Benjamin Faneuil was the father of the celebrated Peter Faneuil. Gillam Phillips was a son-in-law of the elder Faneuil. Henry Dering was the superintendent and agent.

More than twenty years before, a mill with raceway had been built on the Milton side of the Neponset river, seven or eight miles from Boston. This was now leased by Henchman and his associates who also erected a house for their workmen, the upper story of which was left as an

[22] Chapter XV of the *Acts and Laws passed by the Great and General Court in* 1728. *Acts and Resolves of the Province of the Massachusetts Bay,* II., p. 518.

open loft for drying the paper by exposure to the air. The business was slow in being fully started. From the beginning difficulty was experienced in securing capable workmen and work was carried on only in a small and rather desultory way for several years. In 1731 Henchman exhibited to the great and general court in Boston a sample sheet of paper made there, but the mill was probably productive before that date. Soon it became such a local institution that it was alluded to in the letters and the newspapers of the time. One Boston newspaper in 1733 made incidental reference to it in a rhymed advertisement.

THOMAS HANCOCK.

Part Proprietor of the First Paper-Mill in Massachusetts.
From an engraving after the Copley portrait in Memorial Hall, Harvard University.

"In Milton, near the Paper Mill,
A new built house to rent:
Ask of the Printer and you will
Know further to content."

Henchman first employed Henry Woodman, an Englishman, as foreman. After a few years of unsuccess, Dering and Woodman retired. Jeremiah Smith was then engaged to take charge and finally he became the sole owner, purchasing the leased mill and adjoining land in 1741. To assist him he procured Abijah Smith, an American paper-maker, and as foreman John Hazleton, an Englishman. Hazleton was a soldier in one of the British regiments stationed in Boston, and a furlough was granted him to work in the mill, so much was the need of encouraging the manufacture of paper. Shortly, however, when his regiment was ordered to service in Canada, he rejoined the colors, and was among those who met death on the plains of Abraham. Smith continued in the mill until he was an old man, and associated with him in his later years was his son-in-law, James Boies, and Richard Clarke, an experienced paper-maker from New York, who was said to have a superior knowledge of the business and was able to make his own moulds.[23]

In December, 1763, James Boies—or Boyce, as the name was often spelled—and Richard Clarke petitioned the great and general court of Massachusetts, reciting their work in making paper, and employing people "in picking up Raggs and Ropes of which the Paper is made" and asking "a Bounty for their encouragement of this Mystery." Upon this petition the legislative body took action as follows:

> "And as the Paper Mills upon the milton Stream have been very advantageous to the Province but are now in a ruinous Condition; therefore in order to their being repaired
>
> "*Resolved* That the Treasurer be directed to pay into the hands of the Petitioners the Sum of Four

[23] E. B. Crane: *Early Paper Mills in Massachusetts;* in *Collections of the Worcester Society of Antiquity,* VII., p. 115. William Goold: *Early Papermills of New England;* in *The New England Historic-Genealogical Register,* XXIX., p. 158.

> hundred pounds, taking their Obligation without Interest with Sufficient Security for the repayment thereof."[24]

A second mill was built by Boies and he was joined by Clarke, the two being in partnership in this enterprise for several years. The second mill was burned in 1768, but was promptly rebuilt. A third mill was owned in 1771 by Boies and Hugh McLean, his son-in-law. In 1773, George Clarke, son of Richard Clarke, added a fourth mill to this group which had thus expanded in fifty years. The Boies & McLean mill was burned in 1782.

Others identified with the mill before the end of the century were Daniel Vose, who married a daughter of Jeremiah Smith, and Jeremiah Smith Boies, son of James Boies. In 1795 Jeremiah Smith Boies erected another building for the purpose of making paper, chocolate and starch. He employed, as foreman, Mark Hollingsworth from New Jersey, and that introduced into this locality the family of great paper-manufacturers of that name.[25]

These early paper-manufacturers were men of more than ordinary note in their day. Jeremiah Smith was a native of Ireland, coming to Boston in 1726. He was an intimate friend of Governor Thomas Hutchinson and socially prominent. James Boies, who was also an Irishman, born in 1702, lived in Milton until his death in 1796, at the advanced age of ninety-six. He served with General Wolfe in the battle on the plains of Abraham before Quebec, in 1759, and during the revolution was a trusted adviser of the patriots in Dorchester, Mass. He took an active part in constructing, during the night of March 4, 1775, the fortifications on Dorchester Heights which compelled the evacuation of Boston by the British troops. Hugh McLean, born in Ireland in 1724, died in Milton at the age of seventy-five.[26]

Soon after 1730, Samuel Waldo and Thomas West-

[24] *Acts and Resolves of the Province of the Massachusetts Bay,* XVII., p. 443.

[25] Albert K. Teele: *The History of Milton, Mass.,* p. 371.

[26] *Journal of The American-Irish Historical Society,* VI., p. 79 and VII., p. 86.

brook planned to build a mill in Falmouth, Me., and Richard Fry, a paper-maker from England, was associated with them in the enterprise, possibly being the original promoter. Information regarding the affair is derived chiefly from papers in the court files of Suffolk county, Mass. In 1739 Fry was confined in jail in Boston, on account of a debtor judgment of £70 sterling obtained against him by Waldo and Westbrook in the superior court sitting in

SAMUEL WALDO.
Principal Proprietor of the First Paper-Mill in Maine.
Reproduced from an engraving after the oil painting in Bowdoin College.

York, Me. From the jail, on June 22, he petitioned Governor Jonathan Belcher and the council and house of representatives of the province of the Massachusetts Bay for relief, averring that:

> "Your petitioner indented with Mr. Samuel Waldo in the year 1731 in London, to have built, within ten months after my arrival in New England, a paper mill. Your petioner arrived in New England in the year 1731 and waited four years wholy at his own expense, till such time as the said mills were built. Your petioner willing to promote the good of his country, drew a plan for sundry sorts of mills to be built, which was across Presumscot river in Falmouth; which scheme the said Waldo and Westbrook came into and built the said mills. And your petitioner sent for one Mr. John Collier from England, which took the lease of the said mills at two hundred pounds sterling per annum for twenty one years. Your petitioner was to pay sixty-four pounds sterling per ann. for twenty-one years for the papermills."

Fry sought leave to bring a writ of review of his case to be tried in Suffolk county, and also to have a grant of land to recompense him for his expenses in leaving England and for his work in the province. The council was not at all impressed by his claim and his petition was dismissed. Although the petition says that the mills were "across the Presumscot river" other papers in the Suffolk county court files show that it was built on the banks of the Stroudwater river, a small stream near the Westbrook residence, Harrow House, in the outskirts of Falmouth, afterwards Portland, Me. A note about it is in the diary of the Reverend Thomas Smith, minister in Falmouth, under date of September 5, 1733. "We all rode in the Colonel's new road to see where the paper-mill is to be set."[27]

Beyond the statement in the Fry petition, contradicted by court papers, as has been pointed out, no trace has been found of a mill on the Presumpscot. That on the Stroudwater was operated for some years. Workmen from Eng-

[27] William Willis: *Journals of the Rev. Thomas Smith and the Rev. Samuel Deane*, p. 79.

land were employed and it is said that, at one time, they destroyed the machinery, being dissatisfied with the low wages paid them. Waldo and Westbrook could manufacture only by arrangement with Daniel Henchman and his associates of Boston whose charter gave them exclusive rights in Massachusetts Bay, of which province the Maine territory was then part; and their only market was Boston. The mill was finally burned but remains of the dam and foundations of the building existed as late as 1875.[28]

According to the papers in the suit against him, Fry had an active part in the operation of the mill. Waldo and Westbrook leased the mill to him, in 1734, for a term of twenty-one years at an annual rental of £40 sterling, payable quarterly, and they also agreed to build and lease a house for him to live in and to lease to him the saw-mill that stood by the same dam if that should interfere with water needed for the paper-mill. Fry occupied the property until December 25, 1736, but failed to pay his rent. He delivered to his landlords fifty reams of paper valued at £10. That was credited to him on the account for unpaid rent and it was for the balance that suit was brought and judgment obtained which held him in jail for several years.[29] After leaving Maine Fry was in business in Boston as this advertisement shows:

> *"This is to give notice, That Richard Fry, Stationer, Bookseller, Paper-Maker & Rag Merchant from the City of* London, *keeps at Mr.* Tho. Fleets', *Printer, at the Heart & Crown in* Cornhill, Boston; *where said* Fry *is ready to accommodate all Gentlemen, Merchants* and *Tradesmen, . . . I return the Publick Thanks for following the Direction of my former Advertisement for gathering Rags, and hope they will still continue the like method, having received upwards of Seven Thousand Weight already."*[30]

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[28] William Goold: *Early Papermills in New England;* in *The New England Historic-Genealogical Register,* XXIX., pp. 159-163.

[29] Andrew McFarland Davis: *Introduction* to Richard Fry's *A Scheme for a Paper Currency;* in *Club for Colonial Reprints,* Providence, R. I.

[30] *The Weekly Rehearsal,* May 1, 1732. *The New England Weekly Journal,* April 24, 1732.

Again in 1734 Fry specially advertised his connection with this mill, mentioning his interest in it three years before, that is in 1731.

> "It is now almost Three Years, since I Published an Advertisement, to shew you the excellent Economy of the Dutch, in the Paper Manufactory, in order to induce you to follow so laudable an Example; but I am sorry to say, I have had but small Effects of as yet: When Gentlemen have been at great Expense to serve the Public, as well as their own private Interest, it is the Duty of every Person, as much as in them lies, to help forward so useful a Manufactory; *Therefore I intreat all those that are Lovers of their Country, to be very careful of their Linnen Rags, and send them to* Joseph Stocker *in* Spring Lane, *Boston, and they shall receive* ready Money for the same."[31]

It has been suggested that Fry may have been also interested in the paper-mill in Milton, Mass., but no evidence of such connection exists. More likely, as a shrewd wide-awake business man—for such he appears to have been—he was doing his best to get a corner on the few rags in the community, so as to sell again to the needy mills in Maine and Massachusetts. Fry was a picturesque figure in the business life of Boston. He was a litigious individual, and the court records of Suffolk county are laden with cases in which he was plaintiff or defendant. While in jail he evolved a scheme for a paper currency that he submitted to the provincial government only to have it declined, but ultimately to become a treasured rare Americana of later generations. He died in 1745. His widow, Martha Fry, of Boston, took out papers of administration on his estate, describing herself as a "papermaker," which would indicate that he may have maintained some connection with the business until his death.

Samuel Waldo was a Boston man of wealth, prominence and influence, much of his wealth being in real estate. He removed to Falmouth and in the western part of Maine acquired possession of the great "Waldo patent," a tract of land of fully five-hundred thousand acres. Easily he was the foremost man of his time in that section. According to

[31] *The Boston News-Letter,* October 17, and November 8, 1734.

one of his biographers he was ambitious, avaricious and unscrupulous, and if the judgment of some of his contemporaries was correct, he did not permit friendship or other considerations to interfere over-much with any measures that he planned for advancement or acquisition. In the Louisburg expedition, in 1745, he was a brigadier-general, second in command of the Masaschusetts troops.

Thomas Westbrook was a farmer and an owner of real estate. He was associated with Waldo in land speculation in which he was ruined, and he died broken-hearted, by reason of, it is said, the perfidy of his business associate.

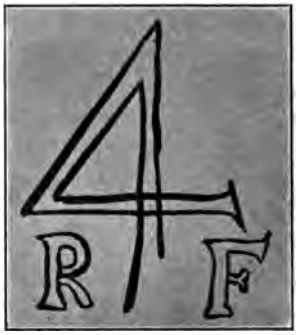
The fourth Pennsylvania mill, which followed the Rittenhouse by forty-six years and the Willcox by seven or more years, was, like others of its predecessors and contemporaries, principally a printer's mill. This was *Die Papier-Muhle der Bruderschaft zu Ephrata,* built at Ephrata, Lancaster county, on the banks of the Cocalico creek. Ephrata was a communistic and ascetic settlement of a branch of the Pietists of Germany who came to Pennsylvania early in the eighteenth century. The members of the community lived in a kloster or convent under monastic rules of celibacy and austerity. They set up several establishments such as grist mills and saw mills and soon the community became a great industrial center. A grist mill was built about 1736 and a paper-mill soon after. At first the Eckerling brothers were in charge of the mill, but after they had been expelled from the community because it was feared that they were becoming too materialistic and practical, the work was directed by Samuel Funk and Jacob Funk, both experienced paper-makers.

The principal product of the mill was a coarse printing paper and what was known as "macalatur," though some finer kinds of writing and printing were made. Ordinary grades of printing were made upon plain sieves without water-mark, but other grades were water-marked. The wire sieves were a domestic product from Isaac Langle, of Germantown, who died in 1743. It was claimed, at one time, that this mill was turning out more paper than any other similar establishment in the colonies. References in the *Chronicon Ephretense* show that the mill was work-

ing as late as 1784. In the diary of Brother Kenon—Jacob Funk—is an entry that on September 1, 1784, "between 2 and 3 o'clock in the morning the new building was set on fire but luckily the fire was extinguished."

Ephrata paper was variously water-marked. An early mark was a large design rudely made, "adopted by the

WATER-MARK OF THE PAPER OF THE EPHRATA MILLS OF THE ZIONITIC BROTHERHOOD, MADE ABOUT 1740.



WATER-MARK OF THE EPHRATA MILLS' PAPER USED IN THE SAUR GERMAN BIBLE, 1743.

Zionitic brotherhood and intended for the distinctly mystical publications" of Ephrata. Its conspicuous feature was a Latin cross surmounted by a scroll on which was graven the word "Zion." Extending from the top of the upright to the ends of the arm of the cross were two keys, these referring to *The Keys of Solomon,* a mystical book of the seventeenth century held in high esteem by the brotherhood. The foot of the cross rested upon a panel upon which was the word "Efrata" and the whole design was surrounded, as in a frame, by an ornamental scroll. This mark is seen on the paper of a book printed at Ephrata before 1745. After the Eckerling period other marks were used particularly indicating the management of the mill by the Funk brothers. One of these, on the fly leaf of a Saur Bible, was the figure 4—the mystical perfect number—and the initials R F—the private mark of the Funk family. Another mark on the paper of some of the publications of the society was F B, standing for Brother

Funk. Then there was a post horn in heart shape with E F, standing for Efrata, in the center; the letters E F on fine writing paper; and sometimes the full name Efrata in letters nearly an inch tall.[32]

Other early Philadelphia paper-makers, though more celebrated as printers, were Christopher Saur—Sower in English—and Christopher, his son. Saur was a German, a university graduate, educated in medicine and with business experience. He came to America in 1724 and settled in Germantown, where he was a farmer and established various branches of manufacturing. He set up a printing press in 1738 and was one of leading printers in the colonies. His paper-mill, built in 1744, or before, was located on a branch of the Frankford river, near the falls of the Schuylkill, not far from what is now Manayunk. The needs of his printing impelled him to try the paper-making business. He printed many books, the most famous of which was the German Bible known by his name, the second Bible printed in America, as is shown by the imprint "Germantown Printed by Christoph Saur 1743."[33] Some of the paper for this Bible, perhaps indeed all, came from the mill in Ephrata, but it is possible that the Saur mill may have supplied a portion of the stock. In the prospectus for this Bible, sent out in 1739, Saur apologized for the seeming high price asked for it—fourteen shillings—saying that the paper he should use cost at least four times as much as like paper cost in Germany.

Upon his death in 1758, Saur bequeathed the mill and its appurtenances and other property to his son Christopher, who became one of the foremost Pennsylvania men of his day in wealth and in business activity and success. He had a large printing business and "employed two or more mills in manufacturing paper."[34] But during the revolution trouble befell him and when he died, in 1784, he was a poor and broken man. On religious principle a non-resistant, as his father had been before him, he would not

[32] J. F. Sackse: *The Ephrata Paper Mill.* In *Papers of Lancaster County* [Penn.] *Historical Society,* I., p. 323-345.

[33] Isaiah Thomas: *The History of Printing in America,* I., p. 24.

[34] Henry Simpson: *Lives of Eminent Philadelphians* (1859), p. 906.

HOME OF THE ZIONTIC BROTHERHOOD, EPHRATA, LANCASTER COUNTY, PENN. THE OLD PAPER MILL IS THE BUILDING IN THE LOWER LEFT CORNER.

participate in the colonial uprising against the British rule, while one of his sons was suspected of being in full sympathy with the British authorities in Philadelphia. Accused of toryism he was placed under arrest in 1778, and, in August of that year, all his property was confiscated and sold, the sale amounting to £17,640.[35]

A Philadelphia historian gives an account of the confiscation and sale of forfeited estates of accused tories in December, 1779, by the government confiscation agent and quotes this entry among the records of such sales: "Christopher Saur, house, paper-mill, saw-mill, mill-dam, etc., Wissahickon road, Roxborough, sold to Jacob Morgan, Jr., for £5,150."[36]

It appears that Virginia had a paper-mill in 1744, the first in that colony. William Parks built it in Williamsburg to feed his printing presses. Parks was the first editor and newspaper publisher in Virginia. He came from England and established *The Maryland Gazette* at Annapolis in 1727, continuing there for eight years. Then, by invitation of the college authorities in Williamsburg, Va., he removed to that place, opened a book-store, set up a printing-press and established, in 1736, *The Virginia Gazette.* Concerning this mill the Virginia historian, Lyon Gardiner Tyler, has written in his *Williamsburg, the Old Colonial Capital:*

> "In 1744 William Parks erected a paper-mill on a branch of Archer's Hope Creek behind the present hospital for the insane, and some verses were printed in *The Virginia Gazette* to celebrate the enterprise of the editor."

The versified tribute from a friendly contributor, to which Tyler referred, was printed in the issue of the *Gazette* for July 26, 1744, and in it, the writer joined praise of paper with the plea for rags, customary to the period. As reprinted in the *Virginia Magazine of History and Biography,* April, 1900, it was as follows:

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[35] Charles G. Sower: *Genealogical Chart of the Descendants of Christopher Sower.*

[36] J. Thomas Scharf and Thompson Westcott: *History of Philadelphia,* I., p. 397.

THE PAPER MILL. Inscrib'd to Mr. Parks.

In nova, fert Animis, mutatas dicere formas, Corpora.
Ovid.

Tho' sage Philosophers have said,
Of nothing, can be nothing made;
Yet *much* thy Mill, O *Parks* brings forth
From what we reckon *nothing worth.*
Hail kind *Machine!*—The Muse shall praise
Thy Labours, that receive her Lays.
Soon as the *Learn'd* denounce the War
From pratling Box, or wrangling Bar,
Straight, Pen and Paper range the Fight;
They meet, they close, in Black & White
The Substances of what we think,
Tho' born in *Thought,* must live in *Ink.*
Whilst willing *Mem'ry* lends her *Aid,*
She finds herself by *Time betray'd.*
Nor can thy Name, Dear *Molly,* live
Without those Helps the Mill must give;
The Sheet now hastens to declare,
How lovely thou, and—my Despair.

Unwitting Youths, whose Eyes or Breast,
Involve in Sighs, and spoil of Rest;
Unskill'd to say their piteous Case,
But miss the Girl for want of *Brass,*
May paint their Anguish on the Sheet;
For Paper cannot blush, I weet.
And *Phillis* (for Bissextile Year
Does only once in Four appear,
When Maids, in dread to lie alone
Have Leave to bid the men *come on*),
Each Day may write to lure the Youth
She longs to wed, or fool, or—both.

Ye *Brave,* whose Deeds shall vie with Time,
Whilst Mill can turn, or Poet rhime
Your Tatters hoard for future Quires;
So Need demands, so *Parks* desires.
(And long that gen'rous Patriot live
Who for soft Rags, hard Cash will give!)
The Shirt, Cravat, the Cap, again
Shall meet your Hands, with *Mails* from *Spain;*
The *Surplice,* which, when whole or new,
With Pride the Sexton's Wife could view,
Tho' worn by Time and gone to rack,
It quits its Rev'rend Master's Back;
The same again the Priest may see
Bound up in Sacred Liturgy.

Ye *Fair,* renown'd in *Cupid's* Field,
Who fain would tell what Hearts you've killed;
Each Shift decay'd, lay by with care;
Or Apron rubb'd to bits at—Pray'r,
One Shift ten Sonnets may contain,
To gild your Charms, and make you vain;
One Cap, a *Billet-doux* may shape,
As full of Whim, as when a Cap,
And modest 'Kerchiefs Sacred held
May sing the Breasts they once *conceal'd.*

Nice *Delia's* Smock, which, neat and whole,
No Man durst finger for his Soul;
Turn'd to *Gazette,* now all the Town,
May take it up, or smooth it down.
Whilst *Delia* may with it dispence,
And no Affront to Innocence.

The Bards, besure, their Aids will lend;
The Printer is the Poet's Friend;
Both cram the News and stuff the Mills,
For Bards have Rags, and—little else.

Your humble Servant,
J. Dumbleton.

Tyler, in his *Williamsburg,* also states that it is believed the mill was in use as late as 1770. In a report made to the London Lords of Trade, relative to the affairs of the colony at this time—printed in the *Virginia Magazine of History and Biography* for 1896—Governor William Gooch recorded the fact that "We have likewise a Paper-Mill."

There seems to have been no other contemporary evidence of the existence of this mill. Parks died in 1750 on the ocean, returning to England. His will, which was probated in Yorktown, Va., June 18 of that year, has no reference to any mill owned by him at that time. His estate was valued at £6,211 15*s.* 9*d.*

Connecticut had no paper-mill until after the middle of the century. Christopher Leffingwell erected a mill upon the banks of the Yantic river in Norwich in 1776 and there made all kinds of paper, printing, writing, wrapping, cartridge and sheathing. The quantity annually produced has been estimated at one thousand three hundred reams, and the prices commanded varied from 4*s* 6*d to* 45*s* per ream. Ten or twelve hands were employed. The mill

was an object of great interest in the community. A private letter, written in October, 1767, said of it:

"The Paper-mill at Norwich is plentifully supplied with rags, and has full demand for its paper. Mr. Throop tells me that he had viewed it when at work; that it is a curiosity; that they mould and make ready for the Press about ten sheets per minute by the watch."[37]

CHRISTOPHER LEFFINGWELL.
Reproduced by permission from Mary E. Perkins' *Old Houses of the Antient Town of Norwich, Conn.*

Although admittedly the mill was erected to meet a pressing economic necessity of the community it was not financially successful in the beginning and government aid was asked for to keep it going as an undertaking of public importance. In May, 1769, the general assembly of the colony granted to Leffingwell an annual bounty of "two pence the quire on all good writing paper, and one penny the quire on all printing and coarser paper" that should be manufactured by him.[38] In 1772 the assembly resolved "that the payment of said bounty be discontinued for the future, and said grant is hereby repealed." The bounty paid to Leffing-

[37] Frances M. Caulkins: *History of Norwich, Connecticut,* p. 607.

[38] *The Public Records of the Colony of Connecticut,* XIII., pp. 212 and 580.

well amounted to £81, 16*s*, 8*d*. In 1775 the edition of *The Connecticut Gazette* containing an account of the battle of Lexington and Concord was printed on paper from this mill. In the following year Leffingwell had his son-in-law, Thomas Hubbard, associated with him and the mill in the hands of Hubbard and his descendants continued in operation far into the next century.

Nearly fifty years elapsed from the time when Bradford essayed to start a mill in New York before the first in that colony was eventually established. This was on Long Island under the encouragement of another printer, Hugh Gaine, who was scarcely less distinguished in his calling than Bradford had been. It was built in Hempstead, on the shore of Hempstead bay, about 1768, by Hendrick Onderdonk and Henry Remsen.

> "The first grist mill on this part of the island, it is believed, was erected here about a century since [1743] by Henrick Onderdonk, and he and his son Andrew afterwards built a paper mill also, which was, it is presumed, the first established in this state. Hugh Gaine, a noted printer and bookseller in the city, was connected with these gentlemen in the manufactory of paper, which has been continued at this place ever since."[39]

Writing from New York, under date of May 7, 1768, to Lord Hillsborough, of the London Board of Trade, concerning manufactures in the colony, Governor Henry Moore said that he would "be particularly attentive to any new Establishments of which we have no instances since my last letter, except in the paper-mill begun to be erected within these few days, at a small distance from the Town."[40] Probably this reference was to the Hempstead mill although the date does not quite agree with the approximate date assumed by the historian Thompson.

In the provincial convention of Maryland, May 25, 1776, James Dorsett came forward with a proposition to build a paper-mill. Dorsett was a member of the convention and that body promptly took action as follows:

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[39] Benjamin F. Thompson: *The History of Long Island*, I., p. 58.
[40] *The Documentary History of the State of New York*, I., p. 736.

> *"Resolved,* That the sum of four hundred Pounds, common money be advanced to *James Dorsett,* of *Baltimore* County, he giving bond with sufficient security to repay the same within two years, without interest, either in cash or Writing or Cartridge Paper, or in such proportions of each as this or a future Convention, or Council of Safety in their recess, shall direct and order; that is to say: one-third part thereof within twelve months, and the other two-thirds within the date of said bond; he at the same time engaging to build a Mill for that purpose within six months from the date of his said contract; and to sell to the inhabitants of this Province any kind of paper which he may make as cheap as the same can or shall be sold at any Mill in the Province of *Pennsylvania."*

Confirming this resolution of the convention the Maryland Council of Safety, June 5, 1776, ordered that the treasurer of the Western-Shore should "pay to Mr. *James Dorsett* £400, like [common] money, to enable him to erect a Paper-Mill."[41]

An early attempt was made to begin paper-making in North Carolina. The German Moravians who originally settled in that state established several industries there before they moved north into Pennsylvania. Among these was a paper-mill which was started in Salem, as early as 1766, according to some authorities. More than half a century later this mill was still in existence; as a North Carolina historian recorded it:

> "In the neighborhood of the town are several mills built in the Middle or Bushy fork and other small branches, as paper &c."[42]

This one lone mill was quite incapable of meeting public needs in that part of the country, as is revealed in the correspondence of that time, private and official. When the colonial congress of North Carolina met in Hillsborough, in September, 1775, the state of the manufactures of the colony was seriously considered and action taken

[41] Peter Force: *American Archives,* 4th Series, V., p. 1600 and VI., p. 1467. *Archives of Maryland,* II., p. 465.

[42] Francois Xavier Martin: *The History of North Carolina,* I., appendix, p. liii.

to encourage them. To the end that a paper-mill might be secured it was resolved:

> "That a premium of two hundred and fifty pounds be given to the first person who shall erect and build a mill for manufacturing of Brown, whited Brown, and good writing paper, and which mill shall be actually set to work, and thirty Reams of Brown, thirty Reams of whited Brown, and thirty reams of writing paper, at least be produced to the provincial Council, and approved of by the said Council within eighteen months from this time; the Brown paper to be of equal goodness to Brown paper imported from Great Britain of the price of two Shillings and sixpence Sterling per Ream, the whited Brown equal in goodness to whited Brown paper imported of the price of three Shillings Stirling per Ream, and writing paper equal in goodness as aforesaid to Eight Shillings Sterling per Ream."[43]

It was not until more than two years later that there was any response to that appeal, as far as the records indicate. In December, 1777, John Holgan, of Orange county, appeared before the congress and secured favorable action upon his petition that the premium should be paid to him if he should be able to produce the paper as required within eight months. In August of the next year Holgan again appeared and, saying that he had erected a mill but had been unable to make the full quantity of paper on account of the lack of water, secured an extension of time of six months. Further evidence of the existence of this mill is in an advertisement "for rags for the Paper Mill just erected near Hillsborough in Orange County," printed in the *North Carolina Gazette,* November 14, 1777.[44]

The provincial congress of South Carolina, in session in November, 1775, considered the subject of the encouragement of manufacturing in the colony, especially saltpetre, sulphur, bar-iron and steel, nail rods, gun locks, paper, lead and linens. Among other resolutions one was passed: "That a premium of five hundred Pounds cur-

[43] William L. Saunders: *Colonial Records of North Carolina,* X., p. 217.

[44] Walter Clark: *State Records of North Carolina,* XI., p. 804, XII., pp. 413, 417, 812, 875.

rency be given to the person who shall first erect and establish a proper Paper Mill in this Colony, upon producing three reams of good writing paper, manufactured thereat." Probably in response to this appeal, William Bellamy appeared before the congress, March 22, 1776, and presented a proposal for erecting "a proper Mill, for making Paper, and cutting Files at the same time," and the congress, favorably considering the proposition, voted:

> "That the sum of three thousand Pounds, currency be advanced to the said *William Bellamy,* out of the Colony Treasury, on loan, for the term of five years, free of interest, in consideration, and for the express purpose of his forthwith erecting a proper Mill for making Paper and cutting Files, in as great perfection as in any part of *Europe;* he, the said *Bellamy,* giving undeniable security . . . for the performance thereof, and for repayment of the said sum."[45]

[45] Peter Force: *American Archives,* 4th Series, IV., p. 72. V., pp. 598 and 606.

CHAPTER THREE

A PAPER POVERTY

MILLS OF THE COLONIAL PERIOD WERE FEW IN NUMBER AND POORLY EQUIPPED—IMPORTATIONS WERE SLOW AND SCANT—NEWSPAPERS RESORTED TO CURIOUS MAKE-SHIFTS — EXTRAORDINARY SCARCITY DURING THE REVOLUTION—LEGISLATIVE ACTION TO ENCOURAGE MANUFACTURING AND CONSERVE SUPPLY

PAPER-MAKING did not keep pace with paper-using. Despite the starting of a few mills the scarcity of paper was more and more decidedly felt in all parts of the country from 1700 on. Public needs steadily increased with the growth of population and the resultant social, industrial and commercial expansion and this increased need was quite in excess of the ability of the market, domestic or foreign, adequately to meet. Partly this was owing to the financial insufficiency of the mass of the people and partly to the difficulties attending the establishment of a new industry where there was a dearth of the indispensable raw materials. Much, however, was fairly chargeable to the studied and persistent opposition of the mother country, though, in this particular, the situation was not peculiar to paper; it prevailed in the case of nearly all manufactured necessities.

In connection herewith there is no call to dwell at length upon the familiar history of the colonial period. As soon as there were indications that manufacturing industries were likely to develop in the colonies the jealousy of the British manufacturers was aroused, for they had always regarded America as altogether an exclusive market for their goods. The British government, acutely responsive

to such argument, and also alive to the political importance of deriving revenue from the colonies and at the same time keeping them under control, discouraged and in every way endeavored to prevent the establishment of manufacturing enterprises that might be expected adversely to affect the interests of the mother country.

As regards paper a single instance will suffice to illustrate this watchfulness. In 1732 and 1733 the subject of the pernicious industrial activity of the colonies was brought up in parliament and the lords' commissioners for trade and plantations were commanded, June 15, 1733, to investigate, and to prepare "an account of the Laws made, Manufactures set up, and Trade carried on, in any of His Majesty's Colonies and Plantations in *America* which may have affected the Trade, Navigation, and Manufacturers of this Kingdom." The report made by the commissioners stated, among other things, that:

> "In the *Massachusetts Bay,* an Act passed in the Year 1728, intituled, *An Act for the Encouragement of Making Paper.* This Manufacture . . . has hitherto made but a small Progress, and can hardly be said, in a strict Sense, to interfere with our own Paper, because almost all the Paper sent to *New England* is foreign Manufacture; but it certainly interferes with the Profit made by our *British* Merchants upon the foreign Paper sent to this Province. However no Complaint has ever been made to Us against this Law."
>
> "Mr. Belcher, the present Governor of this Province [Massachusetts Bay] . . . acquainted us . . . That about Three Years ago a Paper Mill was set up, which makes to the Value of about Two hundred pounds Sterling *per annum.* And he hath since informed us that there hath lately been a new Paper Mill set up at *Falmouth* in *Casco Bay,* which at that Time [1731] had not begun to work for want of Materials."[46]

[46] *The Belcher Papers:* In *Collections of the Massachusetts Historical Society,* Sixth Series, VI., pp. 68, 70 and 489. David Macpherson: *Annals of Commerce,* III., p. 186. *Representation of the Board of Trade, relating to the Laws made, &c. in His Majesty's Plantations in America to the House of Lords,* January 23, 1734, pp. 5 and 12.

The mills referred to were that in Milton, Massachusetts, and that of Waldo and Westbrook in Maine.

Notwithstanding all efforts to repress domestic industries and to hold colonial trade at the command of the British manufacturers and shippers, importations were not easy nor voluminous and most imported goods were costly. This was particularly true of paper. England, still behind in this branch of manufacturing, could in no wise supply the colonial market which continued to be starved; for the domestic mills that had sprung up were as yet so few in number and so limited in capacity that they were far from being able to make up the deficiency.

Then came the stamp act of 1765, and, in 1767, the Townshend measures placing import duties upon glass, paper, pasteboard, lead, painters' colors and tea. Ultimately this legislation was beneficial since it provoked the industrial and political revolt that led to independence. For the moment however it only served to intensify feeling against trade restrictions and to aggravate the economic situation. The non-importation and non-intercourse agreements of the colonists gave added impulse to native enterprise, but it was years before industrial stringency could be brought to an end, in paper as in all else.

Many makeshifts were resorted to in meeting difficulties that arose from this shortage of paper. Newspapers particularly were great sufferers for they were the largest consumers, and evidence of the straits into which they were forced has been fully preserved in them. In some instances the regular weekly issues were omitted because there was no paper. Frequently they were printed upon paper of diverse sizes, colors and qualities, whatever the worried printer might be able to find.

Often curious typographical vagaries were compelled by the necessity of economizing. Printed matter was squeezed in on the margins, outside the usual width of the printed page, sometimes in narrower column measure than in the body of the paper.[47] *The New York Mercury,*

[47] *The Boston News-Letter,* May 29, 1760. *The New York Mercury,* July 30, December 3 and December 31, 1764; February 18, March 4, and May 20, 1765.

For Sale, at Cuyler's Vendue-Room,

THIS Day, Check Linens, Sheeting, Irish Linens, Bread Cloths, Farrel do. Callico-ques, Tickins, Jeans, Fustians, Mens and Womens Silk, Thread and Cotton, Hose, &c. Night-caps; Shoes, Boots, Felt, Castor and Beaver Hats, Gold laced, do. &c. And on Tuesday, at the Orange-Market, a Quantity of damaged Goods.

DAMAGED GOODS.

TO-Morrow will be sold at the Merchant's Coffee-House, at 12 o'Clock, a Quantity of damaged Sail Duck, No. 1, 2, and 3, and Check Linen. Also 2 tree Boxes of Hard Soap.

TO-MORROW,

AT 3 o'Clock in the Afternoon, will be Sold at Vendue, the House and Lot of Ground next Door to Dr. Bard's; 'tis a very Commodious Lot, and the Dimensions large, being 25 Feet in Length on both Sides; and in Front and Rear 28 Feet, Dutch Measure.

To be Sold, at public Vendue,

At Peter Vergereau's Vendue-Store,

AT the House of William Hawthorn, opposite Burling's Slip, on Thursday the 21st Inst. two neat Japann'd Cafe Right-Day Clocks, a Clock without a Case, a Silver Tankard, Tea-Pot, Sugar-Box, and Spoons.—And every Day is expected for Sale, at said Store, the following Goods, viz. Scarlet Cloaks, fine Remnants of scarlet Broadcloth, Shalloons, Plush, Japan'd Waiters, Do. Bellows, Sheeting, quilted Petticoats, Glass Lanthorns, Shoes, &c. &c.

To be Sold, at public Vendue,

ON Tuesday the Second Day of April next, at the Merchant's Coffee-House, the House and Lot of Land, now in Possession of Isaac Latrenche, in Queen-Street, opposite the Treasurer's. A Plan of the Lot to be seen at Tehoman Cuyler's.

To be Sold at public Vendue,

By ISAAC MAN, and JOSEPH FORMAN,

On the 19th Day of March 1765, on the Premises;

THE Mount-pleasant Forge, at Springfield, New-Jersey; consisting of two fires and one hammer, known by the name of Potter's Iron-Works, eight miles distant either from Elizabeth-Town or Newark; with thirty five acres of land lying round the forge, and about one hundred acres of land more within a mile and a half of said forge: There is also great quantities of timber to be had for a trifle, very handy; and a number of the neighbours have obliged themselves by writings under their hands, to furnish wood at a moderate rate, for a number of years to come; within three miles of the premises. The works of the said forge is allowed by men of judgement, to be as compleat as any in the province. There is a strong dam, a very handy and constant stream, not liable to fail by drought, as many others are; it is also fed by springs, and consequently not liable to be stop'd by frost. There is sundry dwelling-houses, a coal-house, a black smith's shop and tools, a barn, a garden, and many other conveniencies on the premises. There will also be sold, coals, cord wood, horses, cattle, teams, and tackle, together with the household goods, &c. For further particulars, enquire of Hans Moe, or Joseph Forman, in New-York, or Mr. Potter, living on the premises.

Extraordinary Encouragement,

FOR sober, honest, and industrious Farmers, Carpenters, Mill Wrights, Wheel Wrights, Black Smiths, Coopers, and Boat Builders; who are inclinable to remove with their Families, against the first of May next, to the New Settlement near Crown-Point, in the County of Albany. Apply personally, or by Letter, to

WILLIAM GILLILAND,

Who wants at the above Settlement, Twenty Cows in Calf, Ten Yoke of Oxen, and one Bull; to be all young and large. They must be deliver'd at Crown-Point, early in the Month of May next.—Any Person willing to contract for them are desired to be speedy in sending him their Proposals.

JAMES MURRAY

Druggist and Apothecary, has removed his Shop from the Meal-Market, to the House at the upper Corner of the Fly-Market, lately Mr. William Kennedy's, Merchant, and has just imported by Capt. Davis,

A Fresh Assortment of the very best genuine Drugs from the Laboratories in London, which he sells, all sale as cheap as any body in Town, of equal Goodness. As he gives constant Attendance, Family and other Prescriptions shall be faithfully made up, and reasonably charged. Commissions from Doctors and Practitioners in the Country, shall be honestly executed, and charged low. no other Dimin

TO BE SOLD,

TWO Bay HORSES, fit for the Saddle or a Chaise, and may be seen at Mr. Leary's.

For the Benefit of Mr. Hulett,

AT Mr. Burns's Assembly Room on Tuesday the 26th Instant, will be a Concert of Vocal and Instrumental MUSICK. Tickets to be had at Mr. Hulett's House in French Church Street, near the English Church.

JOHN KEATING,

HAS just imported in the Ships from Cork, a Quantity of choice Irish BEEF and BUTTER, a few Barrels of Pickled Pork, Oysters, Oyster Tubs, Kegs, &c. which he will sell on reasonable Terms, at his Store in Water-Street, near the Coffee-House Slip.

A Quantity of Choice IRISH BUTTER, IN CROCKS and FIRKINS, for Sale on board the Ship SLIGO, just arrived from IRELAND, at Dr. Cruthen's Wharf.

To be Sold,

A Pair of young Bay Geldings.

Enquire of the Printer.

To be Sold,

By JOHN CHILD,

ON the Corner of the New-Dock, a Small Assortment of Dry Goods, Philadelphia Earthen Ware, Chaise for Sale.

TO be Sold a likely Negro Boy, between 17 and 18 Years old, has had the Small-Pox; is good at Cooking, and handy, to wait on a Gentleman. Enquire of the Printer hereof.

Whereas Peter Gordon, of the City of New York, Merchant, has made an Assignment of all his Affairs, to Jeremy Robinson, Nicholas Wm. Bayard, John Thurman, jun. and Walter Buchanan, for the Benefit of all his Creditors, as by the said Assignment, bearing Date the 18th Day of March, 1765, may more fully appear. All Persons having any Demands on said Gordon, are desired to bring in their Accounts to Walter Buchanan, at his Store in Water-Street, and receive Payment, or they will be precluded the Benefit of said Assignment. And all Persons indebted to said Gordon, are desired to make Payment immediately, to said Buchanan, or they will be put into an Attorney's Hands, by the 1st of April.

A PRINTER'S PAPER ECONOMY.

From the *New York Mercury*, February 18, 1765.

at this time, usually had two wide columns to a page. One issue of four pages had on each of two pages, two wide columns of print and a single narrow column run close up to the outside edge of the page; on each of the other two pages were two wide columns and more text, the same width of column, printed in reverse position, up and down the margin.[48] Sheets of paper that had come from the mould damaged or imperfect or that may have been torn in the handling were not thrown away; on the contrary they were kept and carefully repaired by pasting in order that they might still be used on the press. So skillfully was this repair work done that even now it is difficult to detect in copies of newspapers where such sheets were utilized.[49]

In this exigency a certain Boston printer and stationer—Thomas Fleet—had an unexpected stroke of good fortune. A Spanish ship, sailing for some Mexican, West Indies or South American Spanish destination, in 1748, was captured by an English cruiser and taken into the port of Boston. There her cargo was discharged and sold, among the rest being several bales of papal bulls or indulgences printed on small sheets of very good paper. Fleet bought the entire lot for a low price and used it in his business, printing popular songs or broadsides on the backs of the sheets. Sometimes two songs were printed on the back of a single sheet. Such printings of *Black-Eyed Susan, Handsome Harry,* and *Teague's Ramble to the Camp* and others have been preserved. He also advertised these bulls for sale, in his newspaper in this wise:

> "Choice Pensylvania Tobacco-Paper to be Sold by the Publisher of this Paper, at the Heart & Crown in Cornhill, *Boston;* where may also be had the BULLS or Indulgences of the present Pope Urban VIII. either by the single *Bull,* Quire or Ream, at a much cheaper *Rate* than they can be purchased of the *French* or *Spanish* Priests, and yet will be warranted to be of the same Advantage to the Possessors."[50]

[48] *The New York Mercury,* October 1, 1764.

[49] J. Leander Bishop: *A History of American Manufacturers,* I, p. 206. *The Albany Register.*

[50] *The Boston Evening-Post,* November 14, 1748.

For Sale, at Cuyler's Vendue-Room,

THIS Day, Check Linens, Shirting, Irish Linens, Broad Cloths, Farrell do. Coffee-mills, Thickets, Jeans, Fustians, Mens and Womens Rib. Thread and Cotton, Wash do. Nightcaps; Shoes, Knives, Pelts, Caddoe and Romer Hats, Gold laced, &c. &c. And on Tuesday, at the Orange-Market, a Quantity of damaged Goods.

DAMAGED GOODS.

TO-Morrow will be sold at the Merchant's Coffee-House, at 11 o'Clock, a Quantity of damaged Salt Duck, No. 1, 2, and 3, and Check Linen. Also a few Boxes of Hard Soap.

TO-MORROW,

AT 3 o'Clock in the Afternoon, will be sold at Vendue, the House and Lot of Ground next Door to Dr. Bard's; 'tis a very Commodious Lot, and the Dimensions large, being 92 Feet in length on both Sides; and in Front and Rear 28 Feet, Dutch Measure.

To be Sold, at public Vendue,

At Peter Vergereau's Vendue-Store,

AT the House of William Hawthorn, opposite Burling's Slip, on Thursday the 8th Inst. two neat Japann'd Tea Plate Tea Chests, a Clock without a Case, a Silver Tankard, Pint Day Clocks, a Clock and Spouse.—And every Day is expected for Sale, at said Store, the following Goods, viz. Scarlet Cloaths, Tea-Pot, Sugar, Box, and Spoons.—And every Day is expected fine Amazons or Scarlet Broadcloth, Shalloons, Pink, Japan'd Waiters, Do. Buttons, Shirting, quilted Petticoats, Glass Leathers, Shoes, &c. &c.

To be Sold, at public Vendue,

ON Tuesday the second Day of April next, at the Merchant's Coffee-House, the House and Lot of Land, now in Possession of Isaac Lattouch, in Queen-street, opposite the Treasurer's. A Plan of the Lot to be seen at Tetman Cuyler's.

To be Sold at public Vendue,

By ISAAC MAN, and JOSEPH FORMAN,

ON the 29th Day of March 1765, on the Premises,

THE Mount-pleasant Forge, at Springfield, New-Jersey; consisting of two fires and one hammer, known by the name of Potter's Iron Works, eight miles distant either from Elizabeth-Town or Newark; with thirty five acres of land lying round the forge, and about one hundred acres of land more within a mile and a half of said forge; There is also great quantities of timber to be had for a trifle, very handy; and a number of the neighbours have obliged themselves by writings under their hands, to furnish coal for the premises. The works of the said forge is allowed by men of judgement, to be as compleat as any in the province. There is a strong dam, as many others can desire, not liable to fail by drought, as many others are; it is also fed by springs, and consequently not liable to flood by frost. There is sundry dwelling houses, a coal house, a black-smith's shop and tools, a stable, and many other conveniencies on the premises. There will also be sold, coals, cord wood, barks, cattely teams, and tackle, together with the household goods, &c. For further particulars, enquire of Isaac Man, or Joseph Forman, in New-York, or Mr. Potter, living on the premises.

Extraordinary Encouragement,

FOR sober, honest, and industrious Farmers, Carpenters, Mill Wrights, Wheel Wrights, Coopers, and Boat Builders; who are inclinable to remove with their Families, against the first of May next, to the New Settlement near Crown-Point, in the County of Albany. Apply personally, or by Letter, to

WILLIAM GILLILAND,

Who wants at the above Settlement, Twenty Cows in Calf, Ten Yoke of Oxen, and two Bulls; to be all young and large. They must be delivered at Crown-Point, early in the Month of May next. ☞ Any Person willing to contract for them are desired to be speedy in sending him their Proposals.

JAMES MURRAY

Druggist and Apothecary, has removed his Shop from the Meal-Market, to the House at the upper Corner of the Fly-Market, lately Mr. Walton's, and has just imported by Capt. Davis,

A Fresh Assortment of the very best

genuine Drugs from the Laboratories in London, which he sells, at as cheap as any body in Town, of equal Goodness. As he gives constant Attendance, Family and other Prescriptions, any Part of the Day or Night, may be depended on, and faithfully made up, and reasonably charged. Orders from Doctors and Practitioners in the Country, shall be punctually executed, and charged low, as usual.

TO BE SOLD,

TWO Bay HORSES, fit for the Saddle or Chaise, and may be seen at Mr. Leary's.

For the Benefit of Mr. Hulett,

AT Mr. Burns's Assembly Room on Tuesday the 26th Inst. will be a Concert of Vocal and Instrumental Musick, by Mr. Hulett, Master of the English Charity School, and Others.

Tickets to be had at the Bar of the Assembly Room, at 7s. 6d. each.

JOHN KEATING,

HAS just Imported in the last Vessels from London, a large and general Assortment of Goods, suitable for the present Season, which he will sell by Wholesale or Retail, at his Store in Bridge-street, at the Sign of the Bible, all which he will dispose of on the most reasonable Terms.

A Quantity of Choice IRISH BUTTER, in CASKS and FIRKINS, for Sale by Samuel Ellis, living at the Brick Alley, or Gardner's Wharff.

To be Sold, A Pair of young Bay Geldings.

Enquire of the Printer.

TO be Sold, By JOHN CHILD,

On the Corner of the New-Dock, a Likely Negro Boy, about 17 Years old, has had the Small-Pox, is good in the House, and handy, fit to wait on a Gentleman. Enquire of the Printer hereof.

To be sold, the House wherein John Gordon, of the City

Wherein Peter Gordon, of the

A PRINTER'S PAPER F

From the *New York Mercur*

was in Morristown, N. J. There the volumes served a good purpose, for "their ample margins had been partially used by a commanding officer of the Continental army, when paper was scarce, to write his orders upon."[53]

A general order from Washington's headquarters in New York, July 24, 1776, directed the brigadier-generals, colonels and commanding officers to send in an estimate of the quantity of paper which they needed. Upon receipt of this estimate, which appears to have been promptly made as an emergency measure, the following order was issued, from headquarters, on July 29:

> "The Quartermaster-General is directed to furnish twelve quires of Paper to each Regiment, per month, viz: one quire to the Commanding Officer of the Regiment, one to each Company, and one to the Adjutant; the remaining two quires to be kept by the Colonel, as a reserve for special occasions, exclusive of Orderly books and blank Returns."[54]

Again and again urgent pleas were sent out to induce those who might perhaps have in hand a little paper, to bring it in for the army needs. An example of this requisitioning is a general order from the headquarters of General Gates, at Ticonderoga in August, 1776, as follows:

> "All persons possessed of any whited brown or white paper may have ready money for it at Head-Quarters, or the like quantity and quality immediately returned upon its arrival from *Lake George.*"[55]

The Southern colonies also suffered severely. Paper-mills had not been established there before the revolution and dependence for supplies was placed upon the north or upon foreign importations. The safety committee of North Carolina closely watched the stock of paper in the market, ordering the selling or the holding of it as occasion seemed to require. In connection with one sale it was particularly directed "that one ream be purchased for

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[53] John F. Watson: *Annals and Occurrences of New York City and State in the Olden Time,* p. 67.

[54] Peter Force: *American Archives,* 5th Series, I., pp. 578 and 678.

[55] Peter Force: *American Archives,* 5th Series, V., p. 1126.

the use of this committee only."[56] One ream only! Could anything more strikingly make manifest the meagreness of supply and the patriotic moderation of the committee? In 1781 General Jethro Sumner of North Carolina, in the field, wrote to Colonel Ashe: "Be pleased to have sent me Six Quire of paper and a box of wafers." About the same time Governor Thomas Burke, of the same state, wrote from Williamsborough to Major Tatom:

> "I request you now to procure me a rheam of writing paper from Mr. John Kelly, & to send it by the bearer. Let Mr. Kelly be assured that I will see him paid in tobacco or money (at his election) a reasonable price; and that when I come up, I will agree with him for his whole quantity."[57]

In March, 1782, Colonel Robert Burton wrote to Governor Burke: "I have not at this time one quire of paper, nor the means of procuring it." In the same month Colonel Nicholas Long also notified the governor that: "the camp is nearly destitute of paper."[58] Note the extreme modesty of these requests and the quiet, uncomplaining manner in which these patriots told their simple wants.

In 1783 Thomas Davis, the public printer, reported to the North Carolina assembly that he had been to great trouble and expense "in procuring paper to print the acts of the last assembly" and the assembly, deciding, after investigation, that "neglect of not having the journal of the last session printed did not proceed from Mr. Davis but merely from want of paper" made him an allowance therefor.[59] At the sitting of the assembly in May of that year it was considered necessary to appoint a special committee "to devise ways and means to procure writing paper for the present session, it evidently appearing there will be a want of that article."

Instances like the foregoing could be multiplied a hun-

[56] William L. Saunders: *The Colonial Records of North Carolina,* X., pp. 298 and 305.

[57] Walter Clark: *State Records of North Carolina,* pp. 447 and 564.

[58] Walter Clark: *State Records of North Carolina,* XVI., pp. 222 and 536.

[59] Walter Clark: *State Records of North Carolina,* XIX., p. 167.

dred fold without exhausting the subject. Congress, committees of safety and other patriot directing bodies were compelled to take cognizance of the condition of things and were continually resolving, voting, decreeing and ordering in endeavors to keep the mills going and to increase the paper supply. In Pennsylvania there was special activity in this respect, for more than one-half the paper used in the colonies was then made in or near Philadelphia. The continental congress sitting in that city early recognized the importance of keeping the paper-makers at their trade rather than on the battle front. In July, 1776, Henry Katz and Frederick Becking, on behalf of themselves and other paper-makers in the county of Philadelphia, memorialized the committee of safety for Pennsylvania:

> "That if all the Paper Makers, Masters, Apprentices, and Journeymen within the Ages aforesaid, [16 to 50] should now leave the Trade and follow the Camp, then all and every the Paper Mills in Philad'a County, making the Majority of Paper Mills on this Continent, must immediately be shut up, and, of course, in a few Weeks, the printing offices, even Cartridge Paper, would soon fail."[60]

Perhaps in response to this plaint the congress resolved, on July 19, 1776: "that the paper-makers in Pennsylvania be detained from proceeding with the associators to New Jersey."[61] Confirming and supporting this action the Pennsylvania council of safety, August 9, 1776, enacted the following: "The Honorable Congress having resolved that the Paper-Makers in Pennsylvania be detained from Proceeding with the Associators to New Jersey, all officers of this State are Required to pay a strict Regard to the same."[62]

New York was not less disturbed than Pennsylvania. In a letter, dated May 29, 1776, Charles Loosely and Thomas Elms, paper-makers, petitioned the provincial

[60] *Pennsylvania Archives*, 2d Series, I., p. 615.

[61] *Journals of the Continental Congress*, V., p. 593. *Pennsylvania Evening Post*, July 27, 1776.

[62] Minutes of the Council of Safety, in *Colonial Records of Pennsylvania*, X., p. 680.

congress of New York to exempt them from military service, setting forth that:

> "We humbly beg leave to represent, that we were regularly bred in *England* to the business of paper making, which we understand in all its branches, and have carried to higher degrees of perfection than ever it arrived before in *America,* where we have been the means of increasing the number of paper mills, improving their construction, and moderating the price of paper. But the work being carried on at great expense, (no less than twenty shillings per day for rent, and a number of hands, who require our constant oversight and direction,) we could not attend the forementioned military exercises but at an excessive disadvantage and expense; which would certainly either ruin the business, or oblige us to discontinue it; for the rent would still go on, and the water run to waste; the workmen left to themselves might neglect or spoil the work; disorder and habits of idleness take place, and effectually put an end to that attention, care, industry and frugality, that are absolutely necessary to give success to this business. Nor could it have been in our power to supply you, gentlemen, with the paper for the Provincial money, nor the printers, with whom we have contracted, with the quantities necessary for their weekly publications, which will not admit of disappointment."[68]

A few months later, in August, the same paper-makers, with John Holt, printer, associated with them, again memorialized the New York congress:

> "Your memorialists humbly propose that an immediate order of this honourable Convention be issued to prevent the paper-makers from being compelled or permitted to go upon military service, since, in the present infant state of that necessary manufactory, the check it would receive in either of these cases would, in all human probability, entirely suppress the manufactory, which has been for many months past, and is at present, the only means of supply of paper to every department and business in the State, which, without it, would be laid in the most distressing and extensive difficulties, which will be obvious to every one upon the least consideration.

[68] Peter Force: *American Archives,* 4th Series, VI., p. 615.

> "If this matter should be thought deserving the notice of this honourable House, it is humbly requested that they would, as speedily as possible, issue their orders, since the least delay may irretrievably ruin some paper manufactories which have supplied the Continental stores with great quantities of stores absolutely necessary for publick service, have supplied several other necessary businesses, and are now, by being compelled into military service, upon the very point of dissolution."[64]

Prompt action was taken upon the last memorial, the congress voting, August 14, to exempt from military service the master workman and two attendants at each mill then in operation. John Holt, who joined in the petition, was a famous printer of the revolutionary period. From New Haven, Conn., where he was well established, he moved to New York and in that city published *The New York Gazette and Post Boy* and *The New York Journal.*

So scarce indeed was paper in New York at that time and after, that even the civil government found difficulty, sometimes unsurmountable, in procuring sufficient for its needs. In 1779 Robert Boyd and Samuel Loudon petitioned the legislature "praying permission to raise Three Thousand Pounds by Lottery to enable them to erect and carry on a Paper-Mill." Apparently this project was not then carried out, for, twelve years later, on the first day of the meeting of the legislature in 1791, Samuel Loudon, who was then the state printer, sent a communication to the assembly in relation to the procuring of paper for printing the legislative journals. A committee appointed to consider the subject recommended that money should be raised by lottery "to encourage the making of paper in the state," and a bill was prepared for that purpose. Six reams of writing paper was considered the utmost allowance possible for the governor and legislature, in a legislative resolution of 1781.

Massachusetts officially manifested similar consideration for the welfare of the mills. In 1775 the second provincial congress of that colony, sitting in Watertown, received the

[64] Peter Force: *American Archives,* 5th Series, I., p. 1510.

petition of John Boies and Hugh McLean that four apprentices skilled in paper-making, who had enlisted, should be discharged from the service that they might return to work in the Milton mill. The petition and the answer of the congress were as follows:

> "To the Honorable the Congress of the Province of Massachusetts Bay assembled at Watertown, the petition of James Boise and Hugh McLean of Milton humbly sheweth.
>
> "That your petitioners carry on the business of manufacturing paper at Milton which has been deemed of great utility to the Public, that John Slater, James Calder, William Durant and William Pierce now inlisted in the Provincial Service were all of them apprentices of ye petitioners, and have attained to so great a knowledge in the art of paper making that their attendance in the business is absolutely necessary to its being carried on. That they have done the principal part of the work and labor at your petitioners Mills for two years past; and unless they are released from the service they are now in, tis impossible for your petitioners to continue this so useful and necessary branch of American Industry.
>
> "Wherefore your petitioners pray that the said John Slater, James Calder, William Durant and William Pierce, may be, by order of this Honorable Congress, dismissed as soon as may be, from the service of the Provincial Army. And ye petitioners as in duty bound shall ever pray."
>
> "IN PROVINCIAL CONGRESS, May 16, 1775.
>
> "Resolved—that the prayer of the within petition —Be so far granted, that considering the small number of persons within the Colony who carry on the manufactory of paper, and the great Demand and Necessity of that article for the use of said Colony, that the petitioners be desired to apply to General Thomas, that he may order the within named four soldiers to serve the public in carrying on the manufactory of paper at the said petitioners paper works at Milton." [64 1-2]

At a meeting of the committee of safety of the same

[64 1-2] *Public Archives of Massachusetts*, liber 180, folio 18. Printed in Albert K. Teele's *History of Milton, Mass.* (1887), p. 377.

congress, in May, 1775, announcement was made that a prisoner held in Worcester was a capable paper-maker; an order was forthwith issued that he should be removed to Milton for the need of the mill there.[65]

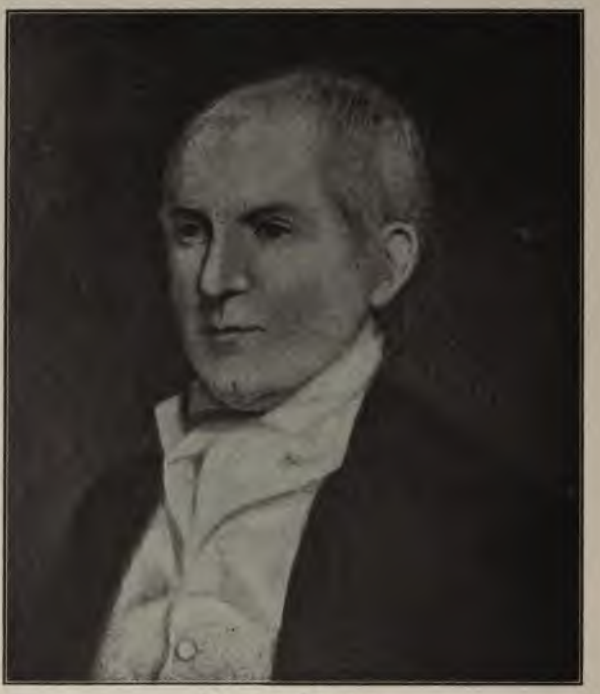
Frequently during the war the patriots were so short of paper for purely military purposes that operations were in danger of being seriously hindered on that account. Paper, especially that suitable for cartridges, was seized whenever the emergency arose. In March, 1778, the Pennsylvania council of safety, then in session in Lancaster county, gave orders to Colonel Andrew Boyd to proceed to the Willcox mill in Chester county and seize all paper there and promptly take it to some place of safety, "as it is probable that the enemy will counteract the design unless you conduct yourself with great secrecy and dispatch." It is to the credit of those who were responsible for this war measure that the paper thus seized was receipted for and subsequently paid for.

Printers' and publishers' paper stock, used and unused, was drawn upon and a great deal of hot shot was poured into the ranks of the enemy wrapped in equally hot sermons, tracts and political addresses printed. The supply of the Ephrata mill was often availed of for military purposes. The story is told that a few days before the battle on the Brandywine, in September, 1777, messengers from the continental army were sent to that mill for paper for cartridges. No paper was on hand, but the brothers of the community gave up an edition of Fox's *Book of Martyrs* which happened to be then ready for the bindery. Also, at Germantown, the printed sheets of a large part of the last edition of the Saur Bible, 1776, were confiscated and used for the same purpose.

Nor were these the only instances of the patriots being forced to extreme measures to supply themselves with cartridge paper. When the American army entered Philadelphia, in June, 1778, there was need for paper for that purpose, but little could be found in the city. In this

[65] *The Journals of the Provincial Congress of Massachusetts, in 1774 and 1775*, edition of 1838, pp. 228 and 549.

emergency about twenty-five hundred copies of a sermon upon *Defensive War,* written to rouse the colonists during the French-Indian war, were discovered in the garret of a house where Benjamin Franklin had previously conducted his printing business. These were seized and promptly turned into material for offensive war, as cases for musket cartridges for the troops in the battle of Monmouth.[66]



NATHAN SELLERS.
Maker of Paper Moulds in Pennsylvania in the Revolution Period.

Scarcity of paper-making machinery added to the trouble. Much of this machinery had been imported from England and when worn out could not be replaced easily. Moulds especially were very scarce and there was no wire in the country to reface them. Here and there was a mechanic who could make moulds but he was a rare individual whose work was jealously regarded. One such was

[66] *The Historical Magazine,* VIII., p. 151.

Nathan Sellers of Darby, Chester county, Pennsylvania. In 1776 he abandoned his work and joined the continental army in New Jersey. The paper-makers who were dependent upon him for their moulds petitioned congress praying "that Nathan Sellers, an Associator in Colonel Paschall's battalion and who has marched to New Jersey, may be ordered to return home and make and prepare suitable moulds, washers and utinsels for carrying on the paper manufactory."

Congress recognized the urgency of the situation and when the petition was presented, on August 20, 1776, it was quickly and favorably acted upon. Sellers was discharged from the service ten days later and returned to his work at home. He was then the only manufacturer of moulds in the country, and the continental authorities, holding that it was of the utmost importance to keep up the paper supply as well as could be, and placing much dependence upon him, engaged him for a time to make moulds exclusively for the government. It was intended that this should enable the mills to produce more promptly and more safely the proper water-marked paper for official purposes. An order of congress, in May 1778, gives evidence of this special employment of Sellers:

> "*Ordered,* That there be paid to Mr. Nathan Sellers, for making a fine paper mould to manufacture paper for bills of exchange, and for his expences coming to York town, and returning home, 164 50/90 dollars."[67]

When the Pennsylvania council of safety, in 1778, ordered Colonel Boyd to seize the paper in the Willcox mill it also revealed the value placed upon these Seller's moulds by advising that officer that:

> "Mr. Willcocks has in his possession a Mould for making paper belonging to this State, which I request you to bring away. It is marked with the word Pennsylvania in 24 places. He did promise, if the enemy came that way, he would throw it into the Mill Dam."[68]

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[67] *Papers of the Continental Congress,* No. 136, II., folio 265. *Journals of the Continental Congress,* XI., p. 415.

[68] *Pennsylvania Archives,* 1st Series, VI., p. 355.

Sellers was of a family that for several generations had been engaged in wire weaving and other manufacturing of like character at the homestead known as Sellers' Hall in Darby township. He belonged to the Society of Friends, but forfeited his membership by his militant activities in the revolution. He built up a large business in wire weaving and mould making, establishing himself in Philadelphia about 1779. He was succeeded by his sons and grandsons, and the business steadily grew in importance for more than half a century, expanding as time went on into the manufacture of various kinds of paper-making machinery and also machines for iron furnaces and rolling mills. Nathan Sellers died in 1830, aged eighty years, and his son and intimate business associate, Coleman Sellers, survived him only four years.[68 1-2]

[68 1-2] *The Paper Trade Journal,* October 16, 1897.

CHAPTER FOUR

EQUIPMENT AND RAW MATERIAL

COLONIAL PAPER WAS ALL HAND-MADE—MACHINERY UNKNOWN—MILLS HAMPERED BY DIFFICULTY IN PROCURING RAW MATERIALS—NEWSPAPERS AND LEGISLATURES IMPLORED PEOPLE TO HELP BY SAVING RAGS—THE EARLY METHODS OF MANUFACTURING—SOME PRICES OF PAPER IN 1729, 1780 AND 1792

DURING the greater part of the first hundred years of its existence, American paper-making was indeed a feeble industry. Many things operated to its disadvantage, cramping its efficiency, curtailing the variety and amount of its production and retarding its development. For at least fifty years after Rittenhouse began in 1690 the mills were few in number, small and meagrely equipped; capable workmen were hard to find; machinery was of the simplest kind; methods were slow and crude.

A list of the items of personal property in a lease of Thomas Brown to Thomas Willcox in 1732, conveying a half interest in the third Pennsylvania mill, sufficiently shows the scant equipment available at that time. It is particularly interesting when considered in comparison with what constitutes the outfit of even the smallest of modern mills.

> "A mortice and [ha]mmers, a Vatt and Pott, two Stuff Tubbs, a Rag knife and Block, one press paper mould and a pair of Shop paper moulds, twenty-six fulling paper felts, Seventy-seven shop paper felts, two press paper Planks and a halting plank, two Shop paper Planks, a Press and Rag wheel, a screw and Box, a Glazeing Engine, two pairing knives, two little

> pails with iron hoops, one smal ads, two pairing frames—one pairing Bench, three cocks, two troughs, one winch, a halfting bench, two tressels, a Iron Barr, six posts and Eighteen Rails for hanging of paper, one hundred polls for hanging paper, one pad, one pair of Stilliards, a Box for Paper Hanging stool, one hundred and sixty Tap pots, twenty cogs and three washers." [69]

Later on some of the mills were more pretentious establishments though still infinitely far from the modern conception of what constitutes a proper plant. The principal improvement was in the introduction of the beating engine which, of Holland origin about 1750, gradually came into use in the American colonies to a modified extent. The first mill in central Massachusetts, built by Abijah Burbank in 1775, was considered one of the best in the country.

> "It was a two-vat mill. A breast-wheel twelve feet in diameter furnished the power to drive the greatest portion of the machinery in the mill, which was composed of two engines with rolls two feet in length and twenty-six inches in diameter, one duster and a grindstone with which to sharpen the bed-plates to the engine. The rags were cut by hand on a scythe fixed in a post, or a long knife, and five men with ten or twelve girls made up the required quota of help. By running the two engines to their full capacity, the accustomed fifteen hours per day, they were able to turn out from two hundred and thirty to two hundred and fifty pounds of paper daily or about one thousand five hundred pounds per week." [70]

The equipment of a really first-class mill toward the close of the eighteenth century is shown in a description contained in the inventory of the mill erected in 1789, in Andover, Mass., as follows:

> "A building occupied as a Paper Mill, 36 by 32 feet, with two vats upon the ground floor, which have a Cast Iron pot in each of them, sunk into Brick chimneys, for heating the vats. The first floor has

[69] Joseph Willcox: *Ivy Mills 1729-1866,* p 6

[70] E. B. Crane: *Early Paper Mills in Massachusetts:* In *Collections of the Worcester Society of Antiquity,* VII., p. 121.

two engines for beating-stuff, a room for dressing rags, with a brick chimney and fire place, also two other rooms for rags. The second floor is occupied for a Rag ware-house.

"Another building connected to the mill by a covered passage way of 20 ft. long, used for drying and keeping paper before finished, 20 by 24 feet, at the end next the mill; a part of the drying-house is taken off for a finishing room, 27 by 24 feet, in which is a cast iron stove used in the winter season. At one side of the finishing-room is a sizing copper set with bricks and brick chimney. Another building 35 feet from the mill, that is 24 ft. by 20, for Rags and finished paper. Another building, 131 feet from the mill, 20 x 13 ft., for Rope and other lumber."[71]

The first mill in western Pennsylvania, that of Jackson & Sharpless in 1796, was regarded as an extraordinarily imposing establishment, described by a local newspaper as "very capacious," The mill building was about seventy-five by forty feet, three stories high, and the entire plant, which included a blacksmith shop, machinery and workmen's houses, represented an investment of six thousand dollars.

A curious and exceedingly interesting chapter in this history of early paper-making in America is that which treats of the persistent and not always successful struggle for raw material to keep the mills going. Rags then constituted the essential fundamental for the industry. Experiments had been made with other materials, but nothing had been discovered as an available substitute. And yet rags were not plentiful and, for more than a hundred years, the existence of the industry was constantly imperiled by this scarcity. The population of the country was not large, and it was scattered. Clothing was not discarded until after careful and long-wearing, for the colonists were poor and the climatic conditions bore severely upon them. In the absence of any incentive to saving, the rag-bag had not become a common adjunct to the household.

After paper-making began, a long and tedious process

[71] Sarah Loring Bailey: *Historical Sketches of Andover*, p. 583.

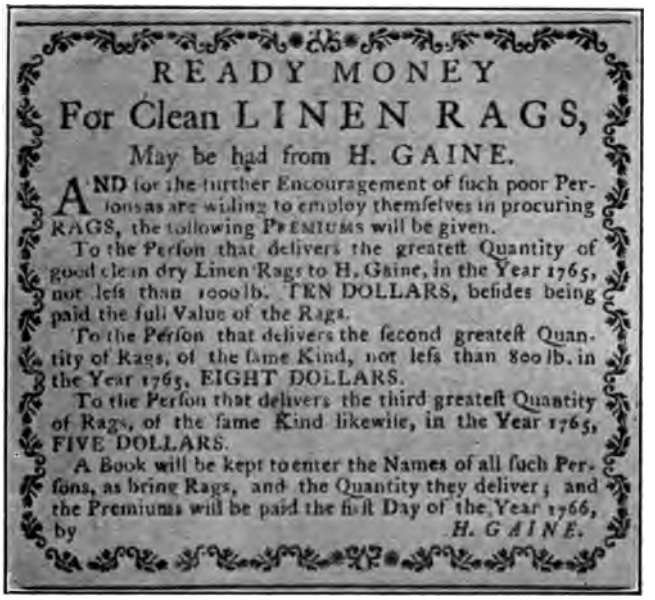
of education was necessary before the people generally could fully realize that this new use for old things hitherto thrown away rendered the habitual keeping of them worth while to families and of public advantage. In advertisements that appealed to patriotism and pocketbook newspapers implored this saving and legislative bodies urged the common need in frequent resolutions. The state of mind of those who had the general welfare most in view is shown by the way in which editors and legislators steadily emphasized the importance of rag saving. This emphasis was even exhibited in the typography of the advertisements and legislative records, for the word RAGS was always capitalized or set in large letters; in this respect it had the same typographic distinction that was given, for example, to Queen, or King, or President, or Parliament, or Congress. One newspaper expressed the fervent hope that every man would say to his wife, "Molly, make a rag-bag and hang it under the shelf where the big Bible lies." Another wished that every child should be taught his "rag lesson."

Specific instances of these advertisements and legislative enactments sufficiently demonstrate the importance that was attached to the encouragement of the industry in this respect. An early advertisement in *The New York Gazette and Mercury,* of which Hugh Gaine was the publisher, establishes the interest which that printer had in the first mill in the New York colony and also reveals the difficulty which this mill, in common with all others, experienced in the shortage of raw material.

> "The printer of this paper, in conjunction with two of his friends [Hendrick Onderdonk and Henry Remsen], having lately erected a PAPER MILL at Hempstead Harbour on Long-Island at a very great expense, the existence of which entirely depends on a supply of RAGS which at present are very much wanted; he therefore most humbly entreats the assistance of the good people of this province, and city in particular, to assist him in the undertaking, which, if attended with success, will be a saving of some hundreds per annum to the colony, which has been constantly sent out of it for PAPER of all sorts, the

manufacturing of which has but very lately originated here; but should the public countenance the same it is more than probable that branch will be brought to considerable perfection in this place. The highest price will therefore be given for all sorts of LINEN RAGS, by the Public's Humble Servant, HUGH GAINE."[72]

Another advertisement, thirty years later,—a reproduction of which from the columns of that newspaper is given herewith,—showed that the printer and his paper-mill were



READY MONEY

For Clean LINEN RAGS,

May be had from H. GAINE.

AND for the further Encouragement of ſuch poor Perſons as are willing to employ themſelves in procuring RAGS, the following PREMIUMS will be given.

To the Perſon that delivers the greateſt Quantity of good clean dry Linen Rags to H. Gaine, in the Year 1765, not leſs than 1000 lb. TEN DOLLARS, beſides being paid the full Value of the Rags.

To the Perſon that delivers the ſecond greateſt Quantity of Rags, of the ſame Kind, not leſs than 800 lb. in the Year 1765, EIGHT DOLLARS.

To the Perſon that delivers the third greateſt Quantity of Rags, of the ſame Kind likewiſe, in the Year 1765, FIVE DOLLARS.

A Book will be kept to enter the Names of all ſuch Perſons, as bring Rags, and the Quantity they deliver; and the Premiums will be paid the firſt Day of the Year 1766, by

H. GAINE.

still struggling with the same problem that had long before been pressing for solution.[73]

The first mill in Massachusetts enlisted the assistance of the first colonial newspaper in this search for rags. Probably the newspaper looked to the mill for its paper and so the two were in a measure interdependent. This is the advertisement that the Boston newspaper published:

"*Advertisement.*—The Bell Cart will go through

[72] *The New York Mercury,* October 4 and 11, 1733.

[73] *The New York Mercury,* January 7, 1765.

> Boston, before the end of next month, to collect Rags for the Paper Mills at Milton, when all people that will encourage the Paper Manufacture may dispose of them. They are taken in at Mr Caleb Davis's Shop at the Fortification. Mr Andrew Gillespie's near Dr Clarke's: Mr Andras Randal's near Philip's Wharf: and Mr John Boris's in Long Lane: Mr Frothingham's in Charlestown, Mr. Edson's in Salem, Mr John Harris in Newbury, Mr Daniel Fowle's in Portsmouth, and the Paper-Mill at Milton."
>
> "Rags are as beauties that concealed lie,
> But when as paper, how they charm the eye;
> Pray save your rags, new beauties to discover,
> For paper truly every one's a lover.
> By Pen and Press such knowledge is displayed
> As wouldn't exist, if Paper was not made.
> Wisdom of things, mysterious, divine,
> Illustriously doth on Paper shine." [74]

When the first provincial congress in Massachusetts met in Salem in 1774 the committee on manufactures reported the necessity of encouraging the making of paper, and the convention voted:

> "That as several paper mills are now usefully employed, we do likewise recommend a preferable use of our own manufactures in this way; and a careful saving and collecting of rags, &c. And also that the manufacturers will give a generous price for such rags, &c."[75]

A year later the proprietors of the Milton mill memorialized the provincial congress that they were not able to get sufficient quantity of rags even though they had raised the price that they were willing to pay. Accordingly the second congress, at its session in February, 1775, at Cambridge, Mass., took action as follows:

> "Therefore. Resolved, That it be recommended, and it is by this Congress accordingly recommended, to every family in this province, to preserve all their linen, and cotton and linen rags, in order that a manufacture so useful and advantageous to this country,

[74] *The Boston News-Letter,* March 9 and 23, 1769.

[75] *The Journals of the Provincial Congress of Massachusetts in 1774 and 1775,* edition of 1838, p. 64.

may be suitably encouraged: and it is also recommended to our several towns, to take such further measures for the encouragement of the manufacture aforesaid, as they shall think proper."[76]

Then, in February 1776, the Massachusetts house of representatives, the council concurring, took this action on the rag situation:

"Whereas, this Colony cannot be supplied with a sufficient quantity of Paper for its own consumption, without the particular care of its Inhabitants in saving Rags for the Paper-Mills:

"Therefore, *Resolved,* that the Committees of Correspondence, Inspection and Safety, in the several Towns in this Colony, be, and they hereby are required immediately, to appoint some suitable person, in their respective towns, (where it is not already done), to receive in Rags for the Paper-Mills; and the Inhabitants of this Colony are hereby desired to be very careful in saving even the smallest quantities of Rags proper for making Paper, which will be a further evidence of their disposition to promote the public good."[77]

The mill in Sutton, Mass., upon which the printers of the central part of the state almost entirely depended during the revolution, was in similar straits and appealed to the patriotism of the ladies for help.

"It is earnestly requested that the fair daughters of Liberty in this extensive country would not neglect to serve their country by saving, for the Paper Mill in Sutton, all Linen and Cotton-and-Linen Rags, be they ever so small, as they are equally good for the purpose of making paper as those that are larger. A *bag* hung up at one corner of a room would be the means of saving many which would be otherwise lost. If the ladies should not make a fortune by that piece of economy, they will at least have the satisfaction of knowing that they are doing an essential service to the community, which with eight pence per pound,

[76] *The Journals of the Provincial Congress of Massachusetts in 1774 and 1775,* edition of 1838, p. 94.

[77] Peter Force: *American Archives,* 4th Series, IV., pp. 1308 and 1455.

the price now given for clean white rags, they must be sensible will be a sufficient reward." [78]

Not less alert than the patriots of Massachusetts were those of Pennsylvania. The records show how, in January 1776, the committee of safety in that colony urged the printers to help the paper-mills:

> "By Order of the Board the following Advertisements were sent to Messrs. *Hall & Sellers,* and Messrs. *Bradfords,* and the other Printers of this city, requesting them to publish them in their next Papers:
> "As Rags and Lint are essentially necessary for the publick service, this Committee most earnestly request the inhabitants of this City to collect what old Linnen they have, and can spare; and, in the course of next week, persons, properly authorized under the hand of the Secretary of the Committee, will call at their houses to receive." [79]

Even the dignified and aristocratic American Philosophical Society of Philadelphia, founded largely through the instrumentality of Benjamin Franklin, felt constrained to give attention to the subject. At a meeting of the society, March 5, 1773, a committee was appointed "to confer with such persons in this City as are concerned in the *Paper Manufactory* on the most probable Means of firmly establishing that branch of business amongst us." At the meeting of the society on March 19 following:

> "Robert Bell waited upon the Society this Evening with a plan for encouraging the Undertaking. Adopted, with a few alterations, and ordered to be published in the several Newspapers of this City. The Money to be paid in Premiums is subscribed by Messrs. Crukshank, Dunlap, Hall, Bell & Humphreys, & Mr. Bell engages to collect it whenever the Society pleases, as will more fully appear by the Subscription Paper delivered by order of the Society, to the Treasurer." [80]

At a subsequent meeting of the society a further en-

[78] *The Massachusetts Spy,* November 26, 1778.
[79] Peter Force: *American Archives,* 4th Series, IV., p. 1562.
[80] *Early Proceedings of the American Philosophical Society,* p. 78. In Vol. XXII of *Proceedings.*

dorsement was given. The plan, thus impressively proclaimed, was simple enough, as it was finally disclosed in the announcement in the newspapers; the now familiar appeal for rags. This was the advertisement:[81]

THE AMERICAN PHILOSOPHICAL SOCIETY, taking into consideration the state of the *Paper Manufactory* in *this province,* find the *only* obstacle to its being improved and greatly extended, is the want of a sufficient quantity of Linen Rags; that this want proceeds principally from the persons who have the greatest opportunity of saving them, not properly considering their usefulness, but frequently burning or otherwise destroying them, when, with a very little trouble, they might be preserved, and become the means of affording employment to a number of useful persons, besides the advantage of saving large sums of money in America, which are now Annually sent to Europe to purchase paper. The *Society* therefore *request* the Masters and Mistresses of families to promote the saving Rags in their houses, and as a farther encouragement than the price of rags will bring, propose to give the following PREMIUMS:

To any person who shall *save,* in *one family,* the greatest quantity of Linen Rags (and *sell* the same for the *purpose* of making *White Paper* in *this province*) before the first day of May, 1774, ... £5 0 0

To any person who shall save and *sell as aforesaid* the next greatest quantity,.... 3 0 0

For the third greatest quantity,..... 2 0 0

For the fourth greatest quantity,..... 1 0 0

For the fifth greatest quantity,..... 0 10 0

A number of persons having at times employed themselves in *collecting* Linen Rags for the Paper Mills, in order to excite them to greater diligence, the following *Premiums* are offered. To any person who shall, before the first day of May, 1774, *collect* the greatest quantity of Linen Rags, suitable for making *White Paper,* and *sell* the same for *that purpose* in *this Province* £5 0 0

To any person who *shall collect,* and *sell* as *aforesaid,* the next greatest quantity... 3 0 0

For the third greatest quantity..... 2 0 0

[81] *The Pennsylvania Gazette,* March 31, 1773.

For the fourth greatest quantity..... 1 0 0
For the fifth greatest quantity..... 0 10 0

Ready money, and the usual Price, for any quantity of *Clean Linen Rags,* may be had of JOHN DUNLAP, Printer, in Market-street, or JOSEPH CRUKSHANK, in Third-street opposite the Work-house, Phila.

Certificates of the quantity of Rags sold each *month, quarter,* or as may best suit the seller, from the persons who are purchasers, will be deemed the same as if they were all sold at *one time.*

By order of the Society
ROBERT STRETTELL JONES, *Sec.*"

The proprietors of a mill in North Carolina went even beyond their northern contemporaries in the fervor of appeal for rags. Not content to rest alone upon the argument of patriotism and self-interest they animated their plea with a flavor of delicate romance, showing that, to them, business had something more than a merely sordid, material side. Their advertisement read:

"By our unhappy Contest with Great Britain, and the Necessary Restrictions on our Trade, Paper has been an Article for which we, in this State, have much suffered, for though there are many Paper Mills in the Northern Colonies, where Paper is made in great Perfection, yet, by the Interruption of the Colony Trade by Water, the Southern Colonies have experienced a very great Scarcity of that necessary Article. To remedy this Evil and throw in their Mite towards the Perfection of American Manufactures, the Proprietors of a Paper Mill just erected near Hillsborough, in Orange County, give Notice to the Public, that their Mill is now ready to work, and if a sufficient Quantity of Rags can be had, they will be able to supply the State with all Sorts of Paper. They therefore request the favour of the Public, and more particularly the Mistresses of Families, and the Ladies in general, whose more peculiar Province, it is, to have all their Rags and scraps of Linen of all Sorts; old Thread Stockings, Thrums from their Linen Looms and every kind of Linen, is useful. As this Undertaking is Novel, saving of Rags may perhaps be thought too trifling, and below the Notice of the good Matrons of the State; but when they consider they are aiding and assisting in a necessary Manufacture, and when the young Ladies are assured, that

> by the sending to the Paper Mill an old Handkerchief, no longer fit to cover their snowy Breasts, there is a Possibility of its returning to them again in the more pleasing form of a Billet Doux from their Lovers, the Proprietors flatter themselves with great Success. Persons in the several Towns and Counties in the State will be appointed to receive Rags, for which a good Price will be given."[82]

When the first mill was started in the western part of Pennsylvania, the usual newspaper notice was printed and the people were called upon to help the enterprise, the dominant note in the announcement being the customary entreaty for rags.

> "The advantages accruing to our community from this addition to its manufacture will be very great, and it behooves every well-wisher to the community to contribute his mite toward the supporting it. It cannot be carried on without a supply of rags. Of these every family can supply more or less, and there will be stores in every town and various parts of the country ready to receive them. Every patriotic family then will doubtless cause all their rags to be preserved and forwarded to some place where they are collected, not so much for the pecuniary advantage to be derived from them as for the pleasure arising from having deserved well of their country. We shall shortly be furnished with a list of such store-keepers as can make it convenient to receive them, and shall then announce their names to the public."[83]

Advertisements in the newspapers of Albany, N. Y., before 1790, called attention to a mill in Bennington, Vt., and urged the need of rags for its maintenance. Ladies were invited to visit the mill and witness the process of paper-making so that they might thereby be influenced to save rags. Postmaster Buel of Troy, N. Y., joined in the appeal and offered to help by receiving rags at his store. At one time this mill depended a great deal upon the cast-off clothing of the Indians and it is believed that the

[82] Walter Clark: *The State Records of North Carolina,* XI., p. 804. *The North Carolina Gazette,* November 14, 1777.

[83] *The Western Telegraphe and Washington Advertiser,* January 12, 1796.

aborigines were persuaded in many specious ways, not always honest, to give up their clothing sometimes before it had really reached the rag condition.[84]

Primitive methods only were applied in the processes of the early mills. All work was by hand. For preparing pulp there were big stone or iron vats or mortars; few

INTERIOR VIEW OF EARLY MILL FOR HAND-MADE PAPER.

mills had more than two vats and many had only one. In these vats, filled with water, the rags were beaten to a pulp

[84] John Woodworth: *Reminiscences of Troy*, p. 46.
In amusing contrast with this condition of things and showing some of the changes that a century had brought about was a statement in the *California State Register* for 1859 where the existence of a paper mill in Marin county, that state, was mentioned as turning out six tons of paper per week, seemingly a remarkable performance. And one of the great benefits ascribed to this enterprise was the "clearing out of the cast-off garments which for years have carpeted the streets of San Francisco and every city and town in the state."

by heavy hammers wielded by hand. From the vats the pulp was ladled into rectangular moulds made with wire-cloth strainers and deckles. As the pulp was flowed into these moulds the thin sheets were interlayed with sheets of felting cloth. Heavy pressure was then brought to bear upon the mass, to squeeze out the water and further to flatten the sheets of pulp into sheets of paper. Then the sheets were taken out one by one and hung on poles to dry in sheds or rooms open to free currents of air.

As far as possible the white rags were set apart for the making of the better qualities of paper, but a general and careful sorting of these raw materials so as to keep those of different colors and qualities entirely separate was not always practicable. Accordingly, for a considerable part, all went into the vats together and the natural result was a pulp of a dirty white or brownish color. No means were used to correct this color condition either before or after the formation of the sheet and no practical method of bleaching was known. Purifying or clearing the water used in the pulp process does not seem to have been even considered necessary and the water was clear and pure only as it might so come in its natural state from its natural sources. A desire to have this water supply as clean as possible, existed, however, and mill sites were selected not alone from considerations of water power, but as well where clean water could be assured. Few streams were then contaminated, for defilement by sewage and chemical and other refuse was as yet unknown.

No method had been devised for producing a smooth surface beyond what might come from heavy pressure. So the paper went into the market unbleached and uncalendered, and the peculiar dark—brown or gray—color and sometimes mottled hue, seen in some of the books and newspapers of the period, is thus accounted for. Occasionally artificial coloring matter, most frequently blue, was introduced into the pulp and a bluish writing or printing paper produced. Newspapers were from time to time printed on paper of this color.[85] The pulp engine from

[85] *The Connecticut Courant*, 1775.

Holland was introduced about 1760 but did not come to general use until long after that date. It was well into the next century before other machinery of importance appeared.

In spite of all these drawbacks improvements were made in the tools used, in the treatment of the raw materials and in methods of manufacture. Naturally these improvements were not of great importance but they did assist in developing the industry and improving the character of the product. On this point it has been remarked:

> "The improvement in paper making, at Willcox's and other mills in Pennsylvania, were principally owing to an Englishman named John Readen. He was a man of great personal ingenuity; and a first rate workman. He had indentured himself to the master of the vessel who brought him from Europe. Willcox redeemed him, and employed him several years. He died in 1806, aged sixty."[86]

That statement is true in a small measure only. Others contributed to improvements in tools and processes even more than John Readen. Most notably was this so, first of such men as William, Claus and Jacob Rittenhouse; William De Wees, Thomas and Mark Willcox, and Christopher Saur, father and son; and then of those who came on in later times, particularly in Pennsylvania and Massachusetts. These were proprietors of mills but primarily they were trained paper-makers and quite as much to them—to say no more—as to any of their employees, credit is due for improvements that enabled paper-manufacturing to develop in the first century of its existence.

Prices that prevailed have been preserved in many merchant accounts of those days. There is a statement of account between Andrew Bradford and Claus Rittenhouse of Philadelphia, dated June 27, 1729. Rittenhouse is charged with various items, including seven hundred and ten pounds of rags, £4, 8*s*, 9*d*, and he is credited with paper sold from his mill to Bradford, as follows:[87]

[86] Isaiah Thomas: *History of Printing in America*, I., p. 24.

[87] *Pennsylvania Magazine of History and Biography*, XII., p. 370.

1729 June	27	By 36 lb press Papers at 9d	£2	2	0
July	3	By 1 Ream writing paper at 14. By 3½ Reams Printing paper at 7/6	2	0	3
	12	By 4½ Reams Brown paper at 4/6. By 2½ Reams printing paper at 7/6 By 45 lbs press paper at 9d per lb By 2 Reams of writing at 14/	4	19	9
	17	By 3 Reams Large printing paper at 10/	1	10	0
	22	By 1½ Reams printing Large at 7/6	0	10	9
August	14	By 11 Reams printing paper at 7/6	0	10	9
	23	By 14 ½ lb Fine press papers at 11d	4	2	6
Septembr	6	By 7 Reams of Brown paper at 4/6	0	13	3
	20	By 5½ Reams of printing paper at 7/6	1	11	6
	22	By 30 lb press papers at 11d By 20 pound press papers at 10d	3	8	0
	27	By 15 lb of press papers at By 3 lb Coarse at	1	10	5
October	18	By 16 lb Paist Board at By ½ a Ream of writing paper	0	12	0
	25	By 86½ lb Bonet paper at 9d By a Ream of Brown	3	11	10½
November	17	By 3 Reams writing at 14 By 2 Reams Brown 4/6	2	6	6
December	3	By 42½ lb paist Board at 7d By 2 Reams of Brown paper at 4/6 By 1 Ream printing..	2	4	6
	11	By 2 Reams Brown paper at 4/6	0	7	6
	20	By 3½ Reams Brown paper at 4/6 By 1 Ream writing paper	1	9	0

	January	17	By 5 Reams Brown paper at 4/6	1	2	6
	March	6	By 5 Reams Brown paper at 4/6 By 2½ Reams Printing paper at 7/6	2	1	3
1730	April	6	By ½ Ream writing at 14	0	7	0
				£36	12	3

In Massachusetts, toward the end of the century, the mills usually had two vats and employed ten men and as many boys and girls. The annual product was about seventy thousand reams of writing, printing and wrapping paper. A two-vat mill required a capital of about $10,000 and its capacity of production annually was from two to three thousand reams of all kinds. Printing paper then commanded a price of from three to three and a half dollars per ream and considerable had to be carried in reserve for customers. The mill in Andover, according to the testimony of one of its owners, a year after it had started in 1791, was carrying stock "in paper of different qualities" to the value of "not less than three thousand dollars," also rags and utensils worth "not less than a thousand more," and "credits to the amount of nearly two thousand." This was not a large business even for that time but evidently it was sufficiently complicated to give the owners some cause for worry.

In central Massachusetts, in 1777, the price paid for linen or cotton and linen rags was three pence per pound; in 1778, eight pence; in 1779, twelve pence, eighteen pence and two shillings; in 1780, three shillings and six shillings and in 1781, ten shillings. A rising market surely. The Troy, N. Y., mill, in 1792 and after, offered three pence per pound for clean white rags and two pence for blue, brown or checked rags. About the same time the pioneer mill in western Pennsylvania was offering four cents per pound for white rags and was selling all the paper that it could produce for one dollar per quire. In 1787 Colonel Nicholas Long requisitioned the governor of North Carolina for supplies for his military camp and submitted in his estimate that he should need "specie to purchase 20

Reams Writing Paper £120." [88] In 1780 James Davis, the state printer, presented to the general assembly of North Carolina a memorial reciting the difficulties under which he labored and the losses he sustained in printing for the state. Therein he referred to the "very extraordinary Rise in Paper, that Article now selling at Newbern from Eighty to one Hundred pounds per Ream." This was a war price, but even at that, it seems bigger than it probably was in reality for the pound was not the pound sterling but the colonial pound which in federal currency was about three dollars and thirty-three cents. [89]

Wages were considered high, but measured by present-day standards they seem absurdly small. Thomas Houghton of the mill in Andover, Mass., wrote to his former home in England, in 1789, saying that he wished he had some English workmen with him, adding:

> "The wages is a great inducement; for good ones, used to writing paper in every stage we would give fifteen shillings per week and board, or fifteen shillings per week and an addition equal to board." [90]

This indicates a weekly wage of about twenty shillings, equal to about five dollars, federal currency at that time. Allowing for the difference in purchasing power of money, then and now, this can scarcely be regarded as a big wage. Trained labor in New England then commanded from three to four shillings per day.

Toward the close of the century the industry had succeeded in making considerable advance and was in a fair way to become a very important manufacture, in the number of mills at work, in the quantity and quality of production, and in an ability more nearly to meet the growing domestic demand. It still labored under difficulties and its shortcomings, especially as compared with its later attainments, may not be overlooked. But it had accomplished much in the economic life of the people and had reached a point where it attracted national attention.

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[88] Walter Clark: *State Records of North Carolina,* XVI., p. 536.
[89] Walter Clark: *State Records of North Carolina,* XV., p. 223
[90] Sarah L. Bailey: *Historical Sketches of Andover,* p. 581.

Few historians, even among those who have essayed particularly to review the economic and industrial development of the country, have gone far enough or carefully enough into examination of the records to appreciate the actual facts concerning the state of this industry at the beginning of our national existence. Undiscriminating observers seem to have been content to measure it by its more obvious deficiencies, and there let the case rest without proceeding further. A popular American historian, writing of the period about 1784, has said:

> "Paper was both scarce and expensive. Some few mills had recently been put up in Pennsylvania, but the machinery was rude, the workmen unskilled, the number of reams turned out each month by no means equal to the demand, and the quality of the paper not much better than that at present used for printing hand bills and posters. Bristol board seems not to have been made in the country and so little of it was brought in from abroad that the loss of it was severely felt."[91]

The foregoing may be accepted as fairly expressing a common opinion among those who have not cared to investigate the matter fully. It is, however, far from being a complete or accurate presentment. Paper was scarce and expensive, it is true, but, all considered, not relatively more so than other things at the close of the revolution. As usual, war had been destructive in this as in other manufacturing industries and, in general, the paper-mill condition reflected the condition of the country. Demand upon domestic productiveness had been abnormally augmented by the cutting off of importations during the war and in the same way raw materials and machinery had been less procurable. Thus from both points domestic productivity had not yet been able wholly to master the situation. But, steadily it was approaching that goal.

In the last decade and a half of the century, the mills were not "few . . . recently put up in Pennsylvania." As has been shown in other chapters of this work, several had been successfully working in Pennsylvania, Massa-

[91] John Bach McMaster: *A History of the People of the United States*, I., p. 79.

chusetts and elsewhere for from fifty to one hundred years while a very considerable number of later day—from 1750 on—were firmly established in Pennsylvania, New York, Connecticut, Massachusetts, Maryland, Delaware and North Carolina. The total annual output cannot be now known but it was not small. Of course the machinery was, in no wise, comparable with that of today. In fact machinery was nearly a negligible quantity, though in that respect the mills were not materially inferior to those elsewhere in the world. Much of it had been imported from Europe, though the war had, for the time being, interfered with that source of supply. Workmen were not unskilled. Many of them, especially the master workmen, were fully capable, having learned the trade in England, Germany, Holland or France, while for fifty years mills of the colonies had been educating men and women to the work; even then women were employed. Bristol board probably was not made but absence of it was not "severely felt" for our ancestors had limited need for it.

Manifestly absurd to anyone who knows about the paper of that period is the statement that "the quality of the paper [was] not much better than that at present used for printing hand-bills and posters." Some of the paper certainly was not superior; in fact none of it was equal to the best that is now made. But the worst was better than the worst of today and there was little indeed that would suffer in comparison with the medium quality of the twentieth century. As has been already noted, rags were apt to be carelessly sorted, pulp was not bleached, machinery was not always efficient and processes were far from perfect. That, however, the best paper was in many respects very good indeed, examination of newspapers, books, pamphlets, broadsides and other prints, and of correspondence, account books, and so on gives evidence.

Much was lacking in purity and regularity of color; this is more observable in the white or natural color paper than in the blue or brown; in texture and in strength it was generally admirable. Newspapers and books printed in the middle of the eighteenth century and before have endured, in well-nigh perfect condition, for one hundred

and fifty years or more, despite much handling and lack of care. At most, their pages have merely browned with age. Is it supposable that as much will be said of the printed sheets of 1900 after another one hundred and fifty years? The anxiety of librarians and book-lovers over the already perishing condition of newspapers and books of the present generation should be sufficient answer to that. Compare a New York newspaper of 1750 with one of 1900 and note the superior enduring quality of the former. Plentiful testimony on this point has been offered. The two references following will suffice.

Horatio Gates Jones made an exhaustive study into the history of the Rittenhouse mill. In his report to the Historical Society of Pennsylvania, May 11, 1863, he dwelt upon the character of paper there produced, adding:

> "A particular feature in the sketch, and in keeping with the subject, is the fact that the paper on which it is written was made at the first paper mill in America, by the first paper-maker and his son, prior to the year 1699."[92]

In an address delivered at the celebration by the New York Historical Society, May 20, 1863, of the two hundredth birthday of William Bradford, John William Wallace, also referring to the Rittenhouse mills, said:

> "From this mill came excellent paper as I can testify, to write or print on. What I read you is written on it. I hold you up a sheet of it."

Still it must not be assumed that all the paper was of this good quality. Some of it was inferior and especially so in a period long after the first years of the industry. Adulterations had become known and were practiced, though not in all the mills. Some of the paper early in the ninteenth century was not as good as that of a hundred years before. It is said that once, in 1816, a set of Bibles crumbled to pieces two years after printing. For quick perishability that paper was a fair rival of considerable that was made seventy or more years later.

[92] *The Pennsylvania Magazine of History and Biography*, XX., p. 333.

CHAPTER FIVE

AFTER THE REVOLUTION

SLOW INDUSTRIAL GROWTH OF THE NATION—PAPER-MAKING STILL CONFINED MOSTLY TO PENNSYLVANIA, NEW YORK, CONNECTICUT AND MASSACHUSETTS — NEW MILLS IN THOSE AND OTHER STATES—LEGISLATIVE ENCOURAGEMENT TO MANUFACTURERS — FIRST INVENTORS—TARIFF MEASURES OF THE GOVERNMENT

IN the two decades and more immediately before independence from Great Britain had been achieved the American colonies had passed through a very varied experience in their industrial and commercial interests. At one time discouraged and in every conceivable way hampered by opposing influences and adverse legislation in the mother country, these interests were ultimately stimulated to a modestly steady and healthful growth by the non-intercourse measures that the political situation developed. Then the war went still further in bringing about a nearly complete commercial severance from Europe, and, to that extent, encouraged the growth of domestic manufactures and shipping.

But the war had its disadvantages as well. The parliamentary restraints that had immediately preceded the seven years' contest had not been without deleterious results, and in the end the states had been left exhausted in men and in means. There had been none of that fictitious boom and business inflation that has often accompanied war and ultimately encouraged industry. Prosperity did not at once ensue. Large importations set in, and the consequent heavy drains of specie from the country brought financial

distress. Money was scarce and credit fell to a low ebb; the people were poor, generally speaking, and too widely separated from each other to have many common interests or to feel much mutuality in enterprise; labor was scarce and wages were high; the public debt was large and burdensome, and business suffered under a worthless paper currency.

Still the outlook was not wholly dark. During the more than a century and a half of colonial existence the people, already of a mixed European racial origin, had developed what has come to be known as the American character, and by patient toil, sturdy self-reliance and energetic utilization of the natural resources of the country they had succeeded in building up domestic industries to very considerable aggregate value. Some of these industries had even been able to furnish small surpluses for exportation, though most of them were still in the infant state. The best that could be said of them was that they were fairly well established and gave promise for the future as soon as stable conditions should gradually come into existence. It was upon this foundation that the substantial advancement and expansion of American industry could safely be predicated.

Paper-making, as has been shown in the preceding chapters, had suffered severely in this period, and it was slower than some other industries in recovering from the post-revolution depression. Many observers were exceedingly sceptical in regard to its immediate future, and the facts of the situation seemed amply to justify their Jeremiah pessimism. A distinguished Frenchman, statesman and political enconomist, traveling in the United States near the end of the century, inspected many mills and wrote concerning them:

> "Besides the dearness of workmanship, their population cannot furnish them rags in quantities sufficient to establish paper mills whose productions would be equal to the consumption of the inhabitants. . . . In proportion to the knowledge which nations may acquire, and to the liberty of the press, which may be enjoyed in America, a prodigious quantity of paper must be consumed there; but can the population of this country produce rags in the same proportion? It

> cannot reasonably be hoped that it will. It is therefore probable that the American markets will not for a long time be provided with any other than European paper, and that this will find a place there."[98]

This was a common opinion at that time, and the French writer evidently was influenced in his conclusions by the beliefs of the many practical men of affairs and publicists whom he met here. Certainly that generation did not see much encouragement in the prevailing conditions.

It would not be possible, nor even if possible, would it be particularly interesting or profitable, to make a catalogue of all the mills of the first hundred years of American paper-making, especially those of later date than 1750 or 1760. They were sufficiently numerous, all things considered, except during the war, when, as we have seen, they were not capable of supplying the deficiency caused by the interruption of trade with Europe. Broadly speaking, however, they were not strong establishments, either financially or mechanically. Most of them had only ephemeral existence and little or nothing about them has been preserved in contemporaneous records; their history, slight and unimportant at the best, was long ago buried beneath the dead weeds of forgetfulness. On the other hand, some of them—though these were few in number and begun in a small way—were, in the course of time, developed into substantial and profitable business enterprises enduring, either in themselves or in their actual successors, into far later times.

Evidence regarding even the most important of the mills of the last quarter of the century is fragmentary and not wholly reliable. As near as can be ascertained, there were probably not above eighty or ninety mills in the country when the war ended. Soon, however, under the stimulus of increased demand and protecting tariff legislation, a few mills began to spring up slowly, particularly in the middle states. De Warville, writing in 1787, said that he had been informed of sixty-three mills—forty-eight in Pennsylvania

[98] J. P. Brissot De Warville: *New Travels in the United States of America.* London Edition, 1794, II., p. 168.

and fifteen in Delaware—their annual production being valued at $250,000. At the same time there were mills in Massachusetts, Connecticut, New York, North Carolina and elsewhere. In the debate on imports in the national house of representatives, April 17, 1789, Representative Clymer of Pennsylvania stated that, "the paper mills of Pennsylvania were so numerous as to be able to supply a very extensive demand in that and the neighboring States; they annually produce about 7,000 reams of various kinds, which is sold as cheap as can be imported."[94]

Massachusetts had made a considerable progress during the fifty years that had elapsed from the establishment of the first little mill in Milton in 1728-1730. Thomas Houghton, part owner of a mill in Andover, Mass., wrote, in the latter part of the century, that there were many mills within twenty and thirty miles of the place where he was located. One authority has said that in 1796 there were three mills in Milton and six, all told, on the Neponset river. Another has said that there were twelve in Massachusetts in 1794 and, again, that there were twenty in the state between 1794 and 1796. Of these seven were located on the Charles river, several of which were in Waltham and Newton, and one each in Worcester, Springfield, Andover and Sutton. The annual production of all the mills in the state was valued at about $100,000.

A mill that attained to considerable importance in the state at this time was that which was put in operation in 1779 on the banks of the Charles river, in Newton, about eight miles out of Boston. There a dam was built by David Bemis and Enos Sumner, who sold a site to James McDougal of Boston, Michael Carney of the now famous Milton mill and Nathaniel Patten, a paper-maker from Hartford, Conn.; and they erected a mill which shortly passed into the hands of Bemis, and, after his death in 1790, became the property of his sons, Luke Bemis and Isaac Bemis. The mill was burned in 1792 or 1793, and the owners petitioned the great and general

[94] Joseph Gales: *The Debates and Proceedings of the Congress of the United States* (1834), I., p. 167.

court of the state for relief in their distress. The response of the legislative body to this appeal is a good example of the governmental paternalism that largely prevailed in those days. The necessity of extending state financial assistance to private business enterprises, as a war measure, during the revolution just brought to a close, had remained as a public policy of more or less general acceptance. In June following the destruction of the Bemis mill by fire the great and general court acted favorably upon the petition of the owners:

> "Representing their great sufferings in the loss of their stock and paper-mills by fire; and in consideration of the public advantage to be derived from the encouragement of the manufacture of paper within this Commonwealth:
>
> "*Resolved,* That there be loaned from the Treasury of this Commonwealth the sum of *one thousand* pounds to the said *Luke Bemis* and *Isaac Bemis,* upon their bonds, with good and sufficient security to this Commonwealth, for the repayment of the same sum at the end of five years; and also to be conditioned that the said *Luke* and *Isaac* shall rebuild, or cause to be rebuilt, within two years from the making of such loan, suitable paper-mills of at least equal size and extent of the mills lately destroyed by fire, and by themselves or their assigns shall prosecute the manufacture of paper therein."[95]

It does not appear that the mill was immediately profitably conducted, for, in 1799, the owners again petitioned the great and general court for an extension of time on the entire loan and, later in the same year, they petitioned and received permission to further postpone their first payment. How, if at all, they finally discharged their obligations the record does not say. But the business was carried on with more or less success for nearly fifty years. Ultimately it was abandoned and the building was turned into a cotton factory and then into a hosiery mill. When the first railroad came there the place took the name of Bemis Station, an appellation that adhered to it forever after. Locally

[95] *Resolves of the General Court, the Commonwealth of Massachusetts,* 1793-94, p. 10. *Ibid,* 1798, p. 51. *Ibid,* p. 18.

THE FIRST MILL IN WALTHAM, MASS., AND ITS SURROUNDINGS.
Reproduced from an engraving in *The Massachusetts Magazine*, April, 1793.

it was known as "Tin Horn," from the circumstance that for many years a huge tin horn was blown morning, noon and night to call the workmen.[96]

Another Massachusetts mill before the end of the century was on the banks of the Charles river, in Waltham, near the center of that town. Known as the Boies paper mill, this establishment was owned and operated by John Boies, of Milton, and produced brown and white paper. It was erected soon after 1780, the exact date not now being known. It attracted much attention, not only from its industrial importance but from its picturesque country surroundings. A contemporaneous periodical printed a picture of it, with a brief accompanying description:

> "We have the pleasure to present our patrons with a south view of Mr. John Boyce's Paper Manufactory, combining a prospectus of his dwelling house and out-buildings, together with a view of the meeting-house, the seats of Messieurs Townsend and Pacy, and Charles River. The situation is acknowledged to be one of the most elegant and delightful in the township of Waltham, and has deservedly acquired the name of EDEN VALE. It is about ten miles from Boston, and one half mile from the Great Road on the Plains."[97]

In 1798 this property was valued at £4,550. Subsequently the paper mill disappeared and upon its site was erected the first cotton mill in Massachusetts. Also in Waltham, about the same time, was a mill built by Governor Christopher Gore, which was operated by William Parker, of Cambridge, and then by Major Uriah Moore and Enoch Wiswell. A third Waltham mill was started about 1798 by Nathan and Amos Upham, brothers who had learned the trade in the Boies mill.[98]

To Newton Lower Falls, near Waltham, about 1790, came John Ware from Sherburne. He was a brother of

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[96] Charles A. Nelson: *Waltham, Past and Present* (1879), p. 125. D. H. Hurd: *History of Middlesex County, Massachusetts* (1890), III., p. 104.

[97] *The Massachusetts Magazine*, April, 1793, p. 192.

[98] Alexander Starbuck: in D. H. Hurd's *History of Middlesex County, Massachusetts* (1890), III., p. 751.

the Reverend Henry Ware of Harvard College. The mill that he built in Newton was the first in a long line of similar establishments that have rendered that place famous in the annals of American paper-making.[99]

An Early Massachusetts Paper-Mill Proprietor.

Springfield, Mass., attempted to have a mill during the time of the revolution. Proprietors of the iron works on Mill river conceived the idea and received from the town

[99] S. F. Smith: *History of Newton, Massachusetts* (1880), p. 272. Francis Jackson: *A History of the Early Settlement of Newton* (1859), p. 105.

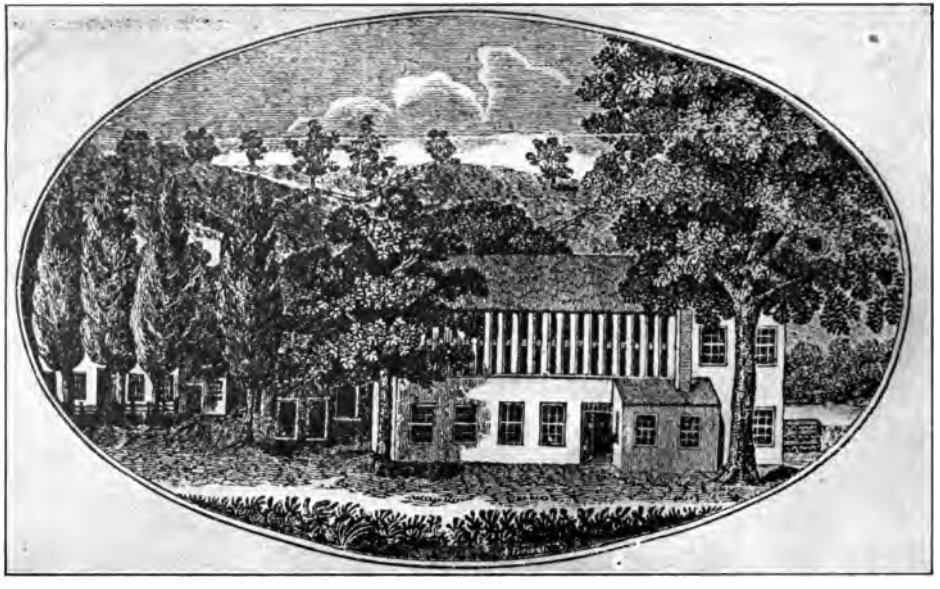
a grant of lands and privileges. For some reason the grant was soon after rescinded and the mill was not built. But in 1786 Samuel Babcock owned a mill there and made a variety of paper, writing, news, cartridge and wrapping.[100] Another mill was established in Springfield prior to 1788, probably by Eleazer Wright. This, in the next century, was developed into the noted and extensive enterprise of the famous Ames family.[101]

A mill was built in Andover, Mass., in 1789 by the Honorable Samuel Phillips, founder of the celebrated Phillips Academy. It was operated by Phillips and Houghton, the junior partner being Thomas Houghton, an experienced paper manufacturer from England. Work was started in an old powder mill, but soon was carried on in a new building erected expressly for the purpose. Phillips had influence in politics—a "pull" we would call it in later time—and had arranged in advance with the state printer to "take at least to the amount of £1,200 a year" of paper. But the business was long in coming to the point of financial soundness, for, as the manager complained, in letters that have been preserved, competition was considerable, rags were high-priced, paper was cheap, and wages were high, while long-time and uncertain credit was a trade condition as necessary as it was discouraging.

A newspaper publisher's need led to the erecting of a mill in central Massachusetts in 1775, or 1776, the sixth or seventh in that colony. Isaiah Thomas, one of the great colonial printers, was compelled to flee from Boston in April, 1775, with the types and press of his famous patriot newspaper, *The Massachusetts Spy,* to escape seizure by the British. Reaching Worcester safely he set up his press there, the revolutionary committee of safety contriving to supply him with paper from the mill in Milton, first "fifty reams of crown, forty of demy, twenty of foolscap and five of writing paper" and again "sixty reams of crown and eight reams of demy." The difficulty of transporta-

[100] Mason A. Green: *Springfield,* 1636-1886. *History of Town and City* (1888), p. 347.

[101] J. E. A. Smith: *Life, Life Work and Influence of Zenas Crane* (1906), p. 15.



THE ISAIAH THOMAS MILL IN WORCESTER, MASS., 1793.
Reproduced from an old wood engraving.

tion across country from Milton to Worcester led the authorities to plan for a supply nearer home and at a convention of delegates from the towns in Worcester county, held May 31, 1775, this action was taken:

> "RESOLVED, That the erecting of a paper mill in this county would be of great public advantage; and, if any person or persons will undertake the erecting of such mill and the manufacture of paper, that it be recommended to the people of the county to encourage the undertaking by generous contributions and subscriptions." [102]

In response, Abijah Burbank of Sutton undertook the venture, but it was a full year before he could show results and then only with a sample of coarse or ordinary paper. It was not until May, 1778, that he was able to inform the public, in an advertisement in the *Spy*, "that the manufacture of paper at Sutton is now carried on to great perfection"; but scarcity of rags and other troubles long hindered him from producing even enough on which to print the *Spy*. For nearly twenty years this mill, managed by its founder and his son, Caleb Burbank, was almost the sole dependence of the printers of that part of the state.

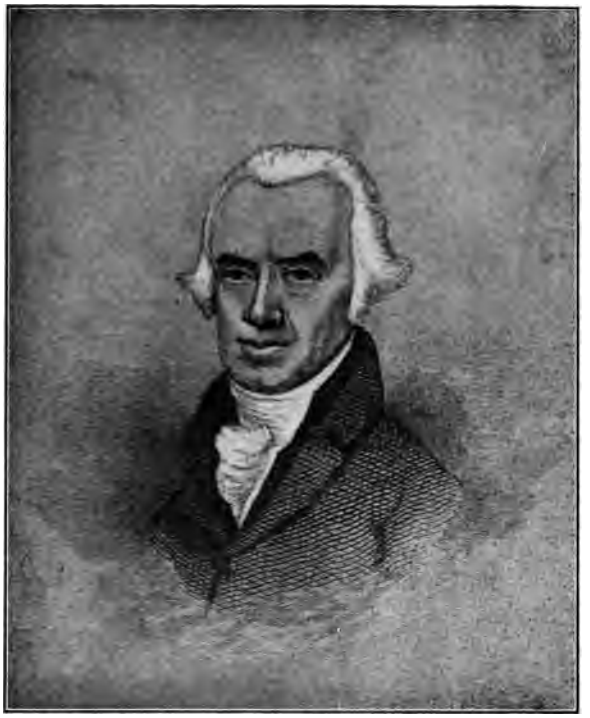
But the demands of the press of Thomas, for whom the mill had been started, constantly outpaced the supply. Isaiah Thomas had become one of the foremost printers and publishers of his day in the United States. At one time he had sixteen printing presses running; he published four newspapers, several editions of the Bible, historical works, law, school and blank books, and controlled book stores in Massachusetts, New Hampshire, New York and Maryland. A great deal of paper was naturally required to keep his presses going and accordingly he planned to build a mill of his own. The mill was put in operation in 1794 but, in 1798, Mr. Thomas sold it to the Burbanks of Sutton, who ran it in addition to their earlier one.

In 1795 Thomas printed an edition of Charlotte Smith's *Elegiac Sonnets and Other Poems*, after the sixth London edition. In the announcement of this work the printer

[102] William Lincoln: *The Journals of the Provincial Congress of Massachusetts in* 1774 *and* 1775 (1838), p. 651.

took occasion to say: "The making of the particular kind of paper on which these Sonnets are printed is a new business in America; and but lately introduced into Great-britain [*sic*]; it is the first manufactured by the editor."

The Thomas mill, which was in Quinsigamond village, Worcester, on the Blackstone river, was supplied with two



ISAIAH THOMAS.
Printer, Publisher, Editor and Paper-Mill Proprietor.

vats of about one hundred and ten pounds capacity, and they ran usually fifteen hours each day, employing ten men and eleven girls. From twelve hundred to fourteen hundred pounds of hand-made paper were turned out weekly. The skilled engineer who managed the plant received about three dollars per week; vat-man and coucher, three and a half dollars each, without board; ordinary workmen and girls, seventy-five cents per week each; boys, sixty cents

each, with their board in addition. These were the wages that generally prevailed in all the mills throughout the country at this time and later.[103]

A third mill in Worcester county, before the century ended, was that of Nichols & Kendall in Leominster, put in operation in 1796.

Rhode Island had its first paper-mill in 1780. Samuel Thurber owned a dam across the Moshassuck river in the town of Providence and he and his three sons, Martin, Samuel and Edward, built a mill. There, in the first years of the next century, bank-note paper was made for the first banks established locally. Two other mills were in Olneyville, a suburb of Providence, in the closing years of the century. One was known as the "Brown George" and the other as the "Rising Sun." Both were owned by Christopher Olney, who marketed his paper from a warehouse in the city.[104]

In Connecticut before the end of the century the Leffingwell mill of Norwich was followed by several others. On the Hockanum river, in East Hartford, afterward Manchester, at the opening of the revolution Ebenezer Watson and Austin Ledyard had a mill, the second in the state. Watson owned the *Connecticut Courant* and this mill was started to supply the press of his newspaper. It also made the greater part of the writing paper used in the Connecticut colony and in the continental army in that part of the country. In 1778 the mill was destroyed by an incendiary fire. In a memorial to the general assembly of the state, petitioning for relief, the owners fixed their loss at $20,000 and stated that their engagement with the *Courant* called for paper of a weekly issue of eight thousand copies.[105] Both Watson and Ledyard had died and the property was owned by their widows, Hannah Watson and Sarah Ledyard. The assembly extended a helping hand by resolving:

[103] E. B. Crane: *Early Paper Mills in Massachusetts.* In *Collections of the Worcester Society of Antiquity,* VII., p. 127.

[104] Richard M. Bayles: *History of Providence County, Rhode Island* (1891), I., p. 589.

[105] J. Hammond Trumbull: *Memorial History of Hartford County, Conn.* (1886), II., p. 250.

> "That, as the rebuilding the said paper mill is of public necessity and utility, the memorialists have liberty, and liberty and authority is hereby granted to them, to set up and cause to be properly drawn a lottery at their risque and charge, to raise a sum not exceeding fifteen hundred pounds, money, to be to the memorialists in proportion to their loss sustained in said mill . . . and that the money that shall be raised by said lottery shall be appropriated to the building of said mill." [106]

A committee of the assembly was ordered to oversee the lottery. Subsequently the property passed into possession of the widow Watson and after her marriage to Barzillai Hudson it was owned by Hudson & Goodwin, who were the joint proprietors of the *Courant* newspaper.[107]

In New Haven about 1776, David Bunce erected a mill at Westville and a few years later another one at the base of West Rock. Charles Bunce, who was an apprentice in this mill, went to Hartford in 1788 and there was in the employ of Hudson & Goodwin and of John Butler, who had succeeded to the ownership of the Butler & Hudson mill that was started before 1784. Bunce, who also had experience in the mill in Andover, Mass., purchased an old building on Hop brook, Manchester, and began the manufacture of paper on his own account. With him his sons, six in number, became associated as they grew to manhood and together they built other mills, members of the family being celebrated paper-makers for sixty years.

Other mills were started in Connecticut about this time and at the end of the century sixteen were in operation. All of them were small affairs, employing together only one hundred and sixty workmen and using annually three hundred and twenty tons of rags.[108]

More than passing notice of Colonel Matthew Lyon, the first paper manufacturer of Vermont, is demanded, in vir-

[106] Charles J. Hoadley: *Public Records of the State of Connecticut* (1858), I., p. 503.

[107] J. Hammond Trumbull: *Memorial History of Hartford County* (1886), II., p. 98. Isaiah Thomas: *History of Printing in America* (1874), I., p. 191.

[108] John Bach McMaster: *A History of the People of the United States* (1885), II., p. 64.

tue of his notable career. He came from Ireland about 1756, a boy of ten years of age, having sold himself to pay his passage. In a few years he was able to redeem himself by working in Connecticut, where he had landed; and, soon after he had come to mature years, he went to Vermont. From that time on his activity was something remarkable. He acquired wealth and influence, married into one of the old-established families of Vermont, built many mills, was one of the founders of the town of Fairhaven, established a democratic newspaper and had other business interests. A man of brilliant qualities of mind, he naturally took an interest in public affairs and led a stormy political life on the rostrum and in the state assembly, being known as "the roaring Lyon of Vermont." An uncompromising democrat, he fought the federalists on the platform and in his newspaper and has been called by his admirers "the American Pym." Under the sedition act his political opponents caused his arrest and succeeded in having him tried and imprisoned. He was then a member of congress from Vermont and his constituents re-elected him while he was in jail. Leaving Vermont he went to Kentucky, where he founded another newspaper and was again elected to congress. Finally he moved to Arkansas and there held other political office before his death in 1822.

Colonel Lyon's paper-mill was in Fairhaven, a small part of his big business interests there. It was built some time between 1790 and 1795 and principally served his own printing establishment. His son James succeeded him in ownership and operation, but the mill passed into other hands in the first years of the next century. It was in operation until after 1880.

New York state had no mill north of the Highlands until near the close of the century. The printers and stationers of Albany and Troy were dependent upon the mills in Hartford, Conn., and Burlington, Vt. From those sources the supply was small and transportation over rough roads and through forests was difficult. The first mill in this section was on the Poestenkill, a small creek that set in from the Hudson river in the outskirts of Troy. It was built in 1792 by Mahlon Taylor "near his dwelling-house"

on the west side of the creek and was supplied with water from a flume which also served a neighboring grist mill and saw mill. Soon after its erection the mill was sold, for £400, to Charles R. and George Webster, printers of Albany, and Ashbel Seymour and Perley Ensign, paper-makers of Hartford. It had a capacity of from five to ten reams daily. A few years later another mill was erected nearby on the Wynantskill. Both these mills were in operation well into the next century.[109]

Joshua and Thomas Gilpin had a paper-mill on the Brandywine river, two miles above the city of Wilmington, Del., in 1787. De Warville, the French statesman, traveling in the United States in 1788, thus wrote of this mill:

> "This town is famous for its fine mills; the most considerable of which is a paper mill belonging to Mr. Gilpin and Myers Fisher, that worthy orator and man of science whom I have often mentioned. Their process in making paper, especially in grinding the rags, is much more simple than ours. I have seen specimens of their paper, both for writing and printing, equal to the finest made in France." [110]

Thomas Gilpin and Miers—not Myers—Fisher were brothers-in-law, Gilpin having married Fisher's sister. The Gilpins and the Fishers were wealthy and influential Quakers, merchants of Philadelphia. Their non-resistance during the revolution brought them into much trouble. Several of them were compelled to remove to Virginia. Among these was Miers Fisher, who, however, returned to Philadelphia after the war had ended, became a successful and wealthy lawyer and was prominent in public affairs, in the city council and in the house of representatives of Pennsylvania. The Gilpin paper was identified by several water-marks. One that was commonly used was a post-horn and the signature, J. G. & Co., Brandywine.

Another Pennsylvanian whose name was associated with these early American enterprises was Benjamin Franklin.

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[109] Arthur James Weise: *The City of Troy and Its Vicinity* (1886), p. 229.

[110] J. P. Brissot de Warville: *Travels in the United States*, (1794), II., p, 362.

First as a printer and a publisher and, later in life, as a scientist and all-around business man, a philosopher, a man of public affairs, a patriot and a far-seeing statesman, he was deeply interested in paper-making, the importance of which, as a fundamental factor in developing American industries generally and in conserving American free institutions, he fully appreciated—no man of his day more

BENJAMIN FRANKLIN.
He Wrote on Paper-Manufacturing and Was Practically Interested in Paper-Mills of Pennsylvania.

clearly. He patronized and encouraged the new mills, particularly those in Pennsylvania, in every way that he could, as a private individual and as a public official. De Warville in his account of travels in the United States relates that Franklin told him that he had been instrumental in starting eighteen mills. Also his intellectual

versatility led him to write on this subject. In June, 1788, he read before the American Philosophical Society in Philadelphia a paper entitled *Description of the Process to be Observed in Making Large Sheets of Paper in the Chinese Manner, with one Smooth Surface.*[111]

Delaware county, Pennsylvania, was a paper-mill center in the latter years of the century. The Willcox mill in Concord township has already been described in detail and it was still in prosperous existence. Others were the Lenni mills of John Lungren on Chester creek, in 1798; the Aaron Matson mill on Chester creek, in 1790 and after; the William Trimble mill in Concord township before 1799; the mill on Darby creek owned in 1778 by Morris Trueman and in 1799 by John Matthews. John Lungren also owned and operated, in 1785, a mill on Ridley creek which had been built by James Willcox in 1766. Members of the Levis family were noted paper-mill owners in this region. Samuel Levis was a maltster in Leicester, England, before he came to America in 1684. Settling in Delaware county on the banks of Darby creek, upper Darby, he devoted himself almost exclusively to the building of mills of every description. His application to this business brought him wealth and made him a man of influence and his descendants for several generations followed his example and profited thereby. Samuel Levis in 1782 and, after him, William Levis, owned and operated a paper-mill in upper Darby township; William Levis bought a mill on Ridley creek before 1795; before the revolution Samuel Levis had a mill on Darby creek; Isaac Levis had a mill on Ridley creek in 1790 and later, and in 1798 his son and son-in-law operated the mill under the alliterative partnership name of Levis & Lewis; William Levis, in 1795, acquired from John Lungren the Willcox mill on Ridley creek in Upper Providence township and his son John Levis was the manager of the property; Thomas Levis, Sr., in Springfield township, owned a mill that, in 1799, had passed into the hands of two of his sons, John Levis and Thomas Levis, Jr. A long and absorbingly in-

[111] *Transactions of the American Philosophical Society*, III., p. 8.

teresting chapter in American paper-mill history of the eighteenth century could be written with Delaware county as the scene of action; and the names of Willcox, Lungren, Levis, Martin and others would illumine it brilliantly on every page.

West of the Allegheny mountains no paper-mill existed until near the close of this century. It was in 1795 that Samuel Jackson and Jonathan Sharpless, Quakers from the eastern part of Pennsylvania, were settled near Pittsburg and conceived the idea of making paper there. Sharpless was a blacksmith and general mechanic who had learned the trade in the Gilpin mill on the Brandywine and Jackson was a farmer, a mill owner, and engaged in other business pursuits. Their mill—the first in that part of the United States—was built upon the Redstone creek, Jefferson township, Fayette county, some four miles east of Brownsville. Many difficulties confronted them even before they could start the mill running, chiefly of course the inevitable scarcity of rags. Advance announcement of their plans was made by the proprietors in a local newspaper advertisement, and in this was incorporated what had now become the familiar and imperative call for rags, as follows:[112]

"TO THE PUBLIC

"Samuel Jackson & Co.:

"Inform the inhabitants of the Western Country that they are making every exertion to forward the completion of their Paper-Mill, which they are erecting on Big Redstone, about four miles from Brownsville, in Fayette county, a never-failing stream. That they have experienced Workmen engaged to carry on the work, and hope to be able before the expiration of the present year to furnish their Fellow-Citizens with the different kinds of paper usually in demand, of their own manufacture, and of as good quality as any brought from below the mountains. They request their fellow-citizens generally to promote their undertaking by encouraging the saving and collecting of rags, and inform Merchants and Store-keepers in particular that they will give them a generous price in

[112] *The Western Telegraphe and Washington Advertiser,* May 24, 1796.

> Cash for such clean Linen and Cotton rags as they may collect.
>
> "Redstone, May 19, 1796."

At the outset writing-paper was made and was carried to Pittsburg in a wagon by one of the owners of the mill and sold to individual customers. Before a year had passed printing-paper was chiefly made and between twenty and twenty-five work people were employed. It appears that the first printing-paper was put upon the market in June, 1797, according to notices in two local newspapers.

> "The paper which you now read was manufactured at Redstone, by Messrs. Jackson & Sharpless, and forwarded with a request to publish thereon a number of the *Telegraphe*, that the public might judge of their performance." [113]

> "This paper is made in the Western country. It is with great pleasure that we present to the public the Pittsburgh *Gazette*, printed on paper made by Messrs. Jackson & Sharpless, on Redstone Creek, in Fayette County. Writing paper, all kinds and qualities, as well as printing-paper will be made at the mill. This is of great importance to the inhabitants of the country, not only because it will be cheaper than that which is brought across the mountains, but it will keep a large sum of money in the country which is yearly sent out for the article." [114]

Eventually the mill was able to produce annually paper to the value of ten or twelve thousand dollars.

A Baltimore historian records that, in 1778, several manufactures were established in or near that town, among them being "a paper mill by Mr. Goddard." [115] This Mr. Goddard was William Goddard, editor of *The Maryland Journal and Baltimore Advertiser.* He was a noted printer, editor and publisher, in Providence, R. I., in 1762; in New York with Holt on *Parker's Gazette and Post Boy;* after 1766 in Philadelphia, where he started the *Pennsylvania Chronicle,* and after 1773 in Baltimore.

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[113] *Western Telegraphe and Washington Advertiser,* June 20, 1797.

[114] *The Pittsburgh Gazette,* June 24, 1797. F. Ellis. *History of Fayette County, Pennsylvania* (1882), pp. 620-623.

[115] Thomas W. Griffith: *Annals of Baltimore* (1824), p. 80.

Plans for another North Carolina mill were projected in 1789, when, in November of that year, Gotlieb Shober and others petitioned the legislature relative to paper-making and were granted a loan of three hundred dollars, without interest, for a term of three years.[116] Additions were made, in this period, to the paper-mill group in Milton, Mass. Most important was that by the Mill Creek and Neponset River Company, which was incorporated in 1798 by Michael McCarney and others. McCarney was of a group of Irishmen long identified with paper-making in Milton, among them being John Sullivan and Patrick Connor.[117]

The first paper-mill west of the Susquehanna river was erected in Georgetown, Ky., in 1793, by Craig, Parker & Co. This appears from several newspaper announcements:

> "Any person understanding paper making or the construction of a paper mill, will please apply at this office."
>
> "A paper mill.—The subscribers inform the publick that they have undertaken to build a paper mill at Craig's Fulling Mill, Woodford County, Ky. They flatter themselves that they will be able to supply the district with paper this coming winter, if the publick will be so obliged to save their rags for the purpose, without which we need not inform them the mill will be useless. We therefore earnestly request them to save their rags. CRAIG & LOGAN."
>
> "Craig, Parker & Co.'s paper manufactory is actually making paper. We make no doubt but that in the course of the spring we shall be able to furnish the State in all kinds of paper, providing we can get a sufficient supply of rags, nor have we any reason to fear from the success we have already had in collecting rags but we shall be plentifully supplied. We earnestly hope that the importance of the manufactory to the State at large is a sufficient argument to induce them to save their rags."
>
> "Wanted at the Georgetown paper mill four or five boys to learn the trade. CRAIG, PARKER & Co."

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[116] Walter Clark: *State Records of North Carolina* (1903), XXI., p. 581.

[117] *Journal of the American-Irish Historical Society*, VI., pp. 79-80, VII., p. 86.

> "Writing and wrapping papers for sale at this office by the ream." [118]

The *Kentucky Gazette* was printed on paper made in this mill, which also supplied the presses of the *Western Spy* in Cincinnati, the *Scioto Gazette* in Scioto, Ohio, and other newspapers in that region. Several historians of early Kentucky days have referred to this mill as an important assistance to the business life of the time.

> "In 1792 a paper mill, the first which had been attempted in Kentucky, was in progress and near completion. For this establishment, which promises to be useful, the country was indebted to the exertions of Craig & Parker. It was near Georgetown and soon after rendered production." [119]

> "The first paper mill was built at Georgetown by the Rev. Elijah Craig, a Baptist preacher, and his partners Parker & Co. The enterprise was begun in the summer of 1791 and the manufacture of paper successfully was not accomplished until March, 1793. The mill house was 40 by 60 feet in size, the basement stone, and the two and one-half stories above of wood. The mill dam was erected in 1789. Here was turned out the first sheet of paper made in the great West. The first mill was burned down in 1837."[120]

Improvements either in paper-making machinery or paper-making processes were slow in coming. The first United States patent law for the protection of inventors was passed in 1790 and a second law in 1793. During the ten years from 1790 to 1800 the number of patents granted was two hundred and seventy-six, of which only four related to the paper-making industry. These pioneers in a great company of distinguished successors from 1800 to 1916 were: John Carnes, Jr., Delaware, improved paper moulds, April 11, 1793; John Biddis, Pennsylvania, improvement in paper-making, March 31, 1794; Cyrus Austin, New Jersey, improvement in paper-making, December

[118] *Lexington Kentucky Gazette,* January 1, 1791; April 7, 1792; March 29, 1793.

[119] Humphrey Marshall: *History of Kentucky* (1824), I., p. 391.

[120] Lewis Collins: *History of Kentucky* (1874), I., p. 516.

14, 1798; Robert R. Livingston, New York, improvement in paper-making, October 28, 1799. John Biddis' patent was for making paper and pasteboard from sawdust. He built a mill for that purpose and around it laid out and developed the town of Milford, Penn.[121]

ROBERT R. LIVINGSTON.
Inventor of an Improved Process in Paper-Making, 1799.

Paper-hangings or wallpaper came into the colonies as early as 1737, but in scant amount until well after the middle of the century. It was not used by pasting on the wall, as in later generations, but was suspended against the wall or on wooden frames as tapestries. Its use was frowned upon by the church as a sinful display of luxury and pride

[121] His name is also given as Biddle, but in the records of the patent office it is Biddis.

and, as it was all imported from England and France and was costly, those two reasons operated to prevent, for a long time, its general adoption. Finally, native manufacturers became interested and, in 1763 and again in 1766, samples of the domestic product were exhibited. In 1789, or soon after, John Carnes of Delaware engaged in the manufacture of paper-hangings on a large scale. He had been the United States consular representative at Lyons, France, and there had learned something about the business. Associating himself with Burrell Carnes and two French workmen by the name of Le Collay and Chardon he was established in Philadelphia.

The breaking out of the revolution stopped the advance of the industry, but after the war had been brought to an end manufacture was taken up again and use rapidly increased. Much was still imported from England and France and in 1787 France, in order further to increase the demand removed the export duty on what was bought by the United States. About the same time mills for paper-hangings were running in Boston, Pennsylvania and New Jersey. In nine months they turned out ten thousand pieces.

By 1794 the Boston mills were producing twenty-four thousand pieces annually, for the demand of that part of the country. Within the first decade of the next century the mills in and near Philadelphia were producing 140,000 pieces annually, valued at $97,417, and at the same time mills of Providence, R. I., were making eight thousand pieces. These early hangings were ordinary in appearance but became quickly popular. They were made from the coarsest and cheapest rags and woolen stuff, in sheets thirty inches long, pasted together; the patterns were stamped upon them with wooden blocks by hand.[122]

In 1786 the Society of Sciences of Philadelphia offered a premium for the discovery or invention of a process for protecting paper from the attacks of insects and also a premium for the best method of making paper for the

[122] J. L. Bishop: *A History of American Manufactures* (1868), I., p. 209. A. S. Bolles: *Industrial History of the United States* (1879), p. 467.

West Indies—particularly San Domingo—especially designed for resisting the attacks of insects peculiar to that region. Several plans were submitted with samples, all of them proposing to use a sizing in which should be mixed ingredients fatal to insect life, but none was considered worthy of endorsement by the society.[128]

It has already been narrated how before and during the revolution state encouragement in various ways was given to those who would engage in paper-making. With the beginning of national existence this policy was continued, only now it was not merely for the purpose of stimulating and developing the industry but also for protecting it from foreign competition. An early effort in this direction was made in 1785 when the legislature of Massachusetts imposed a duty on all foreign vellum and paper. But the people had not yet wholly overcome their repugnance to taxation and the measure did not receive popular approval; accordingly it was repealed.

As long as the states continued under the old confederation there could be no encouragement in a broad general way to domestic industries. The confederation had no power to enact commercial legislation or to enforce treaties and the individual states were distraut by inharmonious and often conflicting laws. The new constitution of 1787 and the government organized under it were regarded by the agricultural, commercial and manufacturing classes as giving assurance of the future where, before, doubt and uncertainty had prevailed. All departments of business were infused with a new spirit of hopefulness and enterprise. Manufacturing, although still considered subordinate in importance to agriculture and commerce, showed signs of a development that promised to be expansive and healthful. American labor began steadily, though slowly at first, to change its form from a general system of manual operations, isolated and local, to the organized efforts of regular establishments with associated capital and corporate privileges, employing more or less of the new ma-

[128] J. L. Bishop: *A History of American Manufactures* (1868), I., p. 206.

chinery which was then coming into use in Europe. The productive classes regarded the constitution of 1787 as conferring the power and right of protection to the infant manufactures of the country in order to encourage their increase and reasonably to insure their success.

When the first congress assembled in March, 1789, one of the first petitions presented to that body was from seven hundred of the mechanics, tradesmen and others of the town of Baltimore lamenting the decline of manufactures and trades since the revolution and asking an early attention to the encouragement of American manufactures by imposing on "all foreign articles which could be made in America, such duties as would give a decided preference to their labors." This petition was followed by memorials of similar tenor from tradesmen, manufacturers and mechanics of Boston, New York, Philadelphia, Charleston and elsewhere. In response to these expressions of public opinion and in accord with the general views of the founders of the republic the first revenue bill which became the basis of subsequent tariff acts was passed.[124]

In the debate on this subject in the national house of representatives, April 17, 1789, Representative Clymer of Pennsylvania urged the claims of the paper-makers of his state, saying that "this manufacture is certainly an important one, and having grown up under legislative encouragement it will be wise to continue it." A duty of seven and one-half per cent *ad valorem* was laid on blank books, writing, printing and wrapping paper, paper-hangings and pasteboard, and, at the same time, provision was made for the admission of rags free of duty.[125] Such, however, was the hesitancy of our law-makers at that time in regard to matters of taxation and tariff that this enactment was decreed for a temporary period only—from August 1, 1789, to August 31, 1790. Before its expiration in 1790 its term of life was extended and some additions were made to it, parchment and vellum being placed in the paper schedule.

[124] J. Leander Bishop: *A History of American Manufactures,* (1868), II., p. 15.

[125] Joseph Gales: *The Debates and Proceedings of the Congress of the United States,* Washington, 1834, I., p. 174.

In 1792 the duty on paper-hangings was placed at fifteen per cent and that on sheathing and cartridge paper at ten per cent. By enactment of June 7, 1794, five per cent. more was added to the duty on sheathing and cartridge. That was the extent of tariff legislation on paper in its various forms prior to 1800.[126]

Alexander Hamilton, first secretary of the treasury of the United States, in his famous report on manufactures, communicated to the house of representatives, December 5, 1791, referred to paper as follows:

> "Manufactories of paper are among those which are arrived at the greatest maturity in the United States, and are most adequate to national supply. That of paper-hanging is a branch in which respectable progress has been made. Nothing material seems wanting to the further success of this valuable branch which is already protected by a competent duty on similar imported articles. In the enumeration of the several kinds made subject to that duty, sheathing and cartridge paper have been omitted. These being the most simple manufactures of the sort, and necessary to military supply, as well as ship building, recommend themselves equally with those of other descriptions to encouragement, and appear to be as fully within the compass of domestic exertions." [127]

[126] *Tariff Acts Passed by the Congress of the United States from 1789 to 1909, House Document, 671, 61st Congress, 2d Session* (1909), pp. 14, 17, 35 and 41.

[127] Gales and Seaton: *Annals of the Congress of the United States* 1791-1793 (1849), p. 1030. Henry Cabot Lodge: *The Works of Alexander Hamilton* (1885), III., p. 409.

CHAPTER SIX

INTO THE NINETEENTH CENTURY

MILLS INCREASED IN NUMBER IN THE FIRST DECADE—STATISTICS FROM THE CENSUS OF 1810 AND ISAIAH THOMAS' ESTIMATE—BUSINESS DEPRESSION AFTER THE WAR OF 1812—TARIFF PROTECTION FOR PAPER——RAGS STILL CONTINUED TO BE SCARCE—SOME PRICES THAT PREVAILED IN 1815 AND 1821

IN business there is no sharp line of demarkation between one year and another, one decade and another, one century and another. Industry moves along, up or down, as the case may be, without regard to chronology and affected by influences and conditions quite other than time. Manufacturing, in all lines, in the United States, advanced rather slowly into the nineteenth century. It felt the stimulus of the new national life and the encouragement of tariff protection but did not spring forward with bounding leaps.

Paper manufacturing was not more active than other occupations. In scope, in methods and in general character, it continued about as it had been going on in the preceding decade or more, and the first quarter of the century had nearly passed before any decided change or very considerable development in it was exhibited. Hamilton's statement, in 1791, that "manufactories of paper are among those which are arrived at the greatest maturity in the United States," may be accepted only with a great deal of reserve as it was plainly a broad generalization rather than a frank presentation of certifiable fact.

When the century opened there were probably a few

more than one hundred paper-mills in the country. Most of these, as their predecessors for a generation or more had been, were small affairs, feeble in every respect, in capital invested, in equipment, in methods used, in persons employed and in amount of annual product. Some of them were establishments of size and industrial importance, measured by the standards of that time, but still infantile in comparison with the majestic mills of to-day. Gradually the number increased, until, by 1810 or thereabout, probably more than two hundred mills were in operation. These figures are obtained from the third federal census report and from results secured, at about the same time, by a private investigator, supplemented by information from local histories and other sources.

A resolution of the national house of representatives, June 7, 1809, called upon the secretary of the treasury, Albert Gallatin, to report on the subject of the manufactures of the country. The report which ensued, although not submitted until nearly a year later, was generally incomplete and defective. The difficulties which, it had been found, hindered the securing even of this scant information constituted the prime reasons for endeavoring to gather more comprehensive and accurate statistics in connection with the impending taking of the third decennial census. Mr. Gallatin was able to report only very meagrely concerning the manufacturing of paper. He said:

> "Some foreign paper is still imported, but the greater part of the consumption is of American manufacture; and it is believed that, if sufficient attention was everywhere paid to the preservation of rags, a quantity equal to the demand would be made in the United States. Paper mills are erected in every part of the Union. There are twenty-one in the states of New Hampshire, Vermont, Rhode Island and Delaware, alone, and ten in only five counties of the states of New York and Maryland. Eleven of those mills employ a capital of two hundred thousand dollars, and 180 workmen, and make annually one hundred and fifty thousand dollars' worth of paper. . . . But sufficient data have not been obtained to form an estimate of the annual aggregate value of the paper made . . . other than what may be inferred from the

population. The manufactures of hanging paper and playing cards are also extensive."[128]

Immediately following the presentation of this report in 1810 came the planning for the census. In this the first effort was made by the government to gather substantial statistics relating to all the manufacturing interests of the country, information that was felt to be needful in the consideration of tariff and other legislation affecting business development. The marshals and their assistants were directed to make an account of the several manufacturing establishments and manufactures in their respective districts with an enumeration of their annual product and other details. Commendable in intent as this plan was it was anything but successful in its results. Only a limited time was possible in which to do the work. Schedules and instructions were not drawn up and furnished to the census-takers so that uniform and complete information should be secured. Manufacturers were not yet accustomed to such investigations and their reluctance to supply facts concerning their business affairs could not be readily overcome.

Therefore the returns as finally made were irregular, deficient and to some extent erroneous. "Accounts from the different states and territories, and even from divisions of the same state, varied with the divergent views of the agents, their intelligence, industry and other qualifications." The returns fell far short of presenting a full and reliable statement of the actual number and condition of the manufactures of the country.

From Pennsylvania, Connecticut, Massachusetts, New York and Virginia the returns were more nearly complete, but even in those much was lacking to a thoroughly comprehensive and dependable exhibit. In other states and territories the deficiencies were even more marked. In general no attempt was made to take account of capital invested, raw material used, number of hands employed and cost of labor. At the most only the number of establishments, the machinery, and the quantity and value of prod-

[128] *Report of Secretary of the Treasury Gallatin to the House of Representatives, April* 17, 1810. In Gales and Seaton: *American State Papers, Class III., Finance* (1832), p. 428.

uct were given; and even in these particulars errors and omissions were abundant. In evidence of these deficiencies many examples have been cited.

> "Thus the number of printing offices—stated by Mr. [Isaiah] Thomas, a competent authority, at more than 400 in 1810—was returned by the marshals as 110. Bookbinders, calico printers and dyeing establishments were returned only for one state. No glass works were returned for Massachusetts, which had long made and exported glass of a superior quality to other states. Bark mills were given for only one state; carriage makers for three; blacksmiths' shops for five; hatters for four; tin and copperware shops for two—and these the least considerable in that branch. The number of tallow candle factories in Massachusetts was not given, although that state was credited with nearly one-half the product in that branch, and the same was the case with morocco factories." [129]

Despite all these shortcomings, however, the returns were interesting as the first systematic official statement of American manufactures and they contained a great deal of desultory information that was valuable. After futile attempts had been made to digest and arrange this mass of material into some comprehensible form, the secretary of the treasury, in obedience to a joint resolution of both houses of congress, submitted the papers for examination and review to Mr. Tench Coxe of Philadelphia, a recognized authority at that time, on statistics and economics. Mr. Coxe returned to congress in June, 1813, the results of his work, and in his analysis we have the first understandable account, meagre though it is, of the manufacturing pursuits of the country.

Paper-making did not figure large in that census report. The marshals returned a summary of $127,694,602 as the value of all the manufactured products of the country and of that amount the sum of $1,939,285 was credited to manufactures of paper, pasteboard, cards, etc. From a consideration of all the reported details and estimation of manu-

[129] J. L. Bishop: *A History of American Manufacturers* (1868), II., p. 159.

factures which were omitted or imperfectly returned Mr. Coxe amended the figures of the marshals by extending them to $172,762,676, slightly more than thirty-five per cent. On that basis of calculation the value of products under the paper-making schedule would rise to more than $2,600,000 which would probably be not an overestimate. Paper and its derivatives, then, constituted only about two and one-half per cent of the total manufactures of the country. The following statement accompanied the report:

States, Territories and Districts	Mills	Reams	Value of Product
Maine	2	4,500	$16,000
Massachusetts	23	95,129	290,951
New Hampshire	6	——	42,450
Vermont	11	23,350	70,050
Rhode Island	3	14,625	53,297
Connecticut	19	——	82,188
New York	28	77,756	233,268
New Jersey	14	10,380	49,750
Pennsylvania	64	165,981	626,749
Delaware	4	——	75,000
Maryland	9	22,200	77,515
Virginia	4	3,000	22,400
Ohio	2	——	10,000
Kentucky	6	6,200	18,600
North Carolina	3	2,400	6,000
East Tennessee	2	——	15,500
South Carolina	1	——	——
District of Columbia	1	——	——
	202	425,521	1,689,718

A few more than one half of these mills were in New York, New Jersey and Pennsylvania and more than sixty were in New England, while those remaining were scattered in nine smaller states and territories, among which Maryland was conspicuous with nine and Kentucky with six. In addition to the foregoing tabulation of products the mills of Massachusetts were credited with twenty-two thousand five hundred rolls of paper, Rhode Island with

eighty-eight and three-quarter tons and Pennsylvania with three hundred and forty tons.[180]

At the same time that the United States marshals and their assistants were engaged in collecting these facts, Mr. Isaiah Thomas was carrying on a similar investigation and evidently with more conscientiousness and intelligence. He found that the total number of mills which he could trace was one hundred and ninety-five, and was certain that more existed. His statement of the result of his research was:

> "My endeavors to obtain an accurate account of the paper mills in the United States have not succeeded agreeably to my wishes, as I am not enabled to procure a complete list of the mills, and the quantity of paper manufactured in all the states. I have not received any particulars that can be relied on from some of the states; but I believe the following statement will come near the truth. From the information I have collected it appears that the mills for manufacturing paper are in number about one hundred and eighty-five [*sic*], viz.: in New Hampshire, 7; Massachusetts, 40; Rhode Island, 4; Connecticut, 17; Vermont, 9; New York, 12; Delaware, 10; Maryland, 3; Virginia, 4; South Carolina, 1; Kentucky, 6; Tennessee, 4; Pennsylvania, about sixty; in all other states and territories, say 18. Total 195, in the year 1810.
>
> "At these mills it may be estimated that there are manufactured annually 50,000 reams of paper, which is consumed in the publication of 22,500,000 newspapers. This kind of paper is at various prices according to the quality and size, and will average three dollars per ream; at which this quantity will amount to 150,000 dollars. The weight of the paper will be about 500 tons.
>
> "The paper manufactured and used for book printing may be calculated at about 70,000 reams per annum, a considerable part of which is used for spelling and other small school books. This paper is also of various qualities and prices, of which the average may be three dollars and a half per ream, and at that price it will amount to 245,000 dollars, and may weigh about 630 tons.

[180] Gales and Seaton: *American State Papers, Class III., Finance* (1832), II., pp. 666 and 706.

"Of writing paper, supposing each mill should make 600 reams per annum, it will amount to 110,000 reams, which at the average price of three dollars per ream will be equal in value to 333,000 dollars, and the weight of it will be about 650 tons.

"Of wrapping paper the quantity made may be computed at least at 100,000 reams, which will amount to about 83,000 dollars.

"Beside the preceding articles, of paper for hangings, for clothiers, for cards, bonnets, cartridge paper, paste-boards, etc., a sufficient quantity is made for home consumption.

"Most of the mills in New England have two vats each. Some in New York, Pennsylvania, Delaware and Maryland have three or more. Those with two vats can make, of various descriptions of paper, from 2,000 to 3,000 reams per annum. A mill with two vats requires a capital of about 10,000 dollars, and employs twelve or more persons, consisting of men, boys and girls. Collecting rags, making paper, etc., may be said to give employment to not less than 2,500 persons in the United States.

"Some of the mills are known to make upwards of 3,000 reams of writing paper per annum; a few do not make any; but there are not many that make less than 500 reams. The quantity of rags, old sails, ropes, junk, and other substances of which various kinds of paper and paste-boards are made, may be computed to amount to not less than three thousand five hundred tons yearly."[131]

During the second struggle with Great Britain, 1812-1816, paper-manufacturing, in common with other industries, was very much hampered by the continued shortage of raw material and the difficulty of procuring moulds and engines from abroad. Rise in the wages paid to workmen and in the cost of all machinery and materials led to high prices and a contracted production that materially affected the users of paper who were also deprived of the importations that they had heretofore been able to rely upon.

War brought other troubles, aggravating though minor, to the printers. British ships infested American waters

[131] Isaiah Thomas: *The History of Printing in America*, I., p. 25. Vol. V. of *Transactions and Collections of the American Antiquarian Society* (1874).

and interfered with domestic commerce. Even closed-in waters, like Long Island Sound, were not free from them and ships sailing in and out of the port of New York were often in danger. One incident of the kind was recorded by one of the victims who, however, as will be seen from his announcement, endeavored to turn it to his advantage, as much as might be. On October 9, 1814, the packet *Susan,* commanded by Captain John Miles, sailing from New York to New Haven, Conn., was captured by a British sloop of war off the harbor of Bridgeport. Part of her cargo was printing paper for the New Haven newspapers as appears from the following:

> "Our Patrons must pardon us for giving them a very inferior quality of paper this week. Fortune has frowned upon the printer, and placed in the hands of the enemy, by the capture of the *Susan,* our stock of paper for several months, worth between 200 and 300 dollars. It will be obtained, however, by paying nearly its value over again. Our friends who are in arrears at this office, it is hoped, will not remember to forget the publisher at this time."[182]

On the whole, however, paper-making seems to have been less affected than other manufacturing by conditions arising from the war. In many lines of business there had been a certain unhealthful inflation in consequence of increased domestic demand and naturally resultant high prices; and much capital was put into new undertakings which despite all drawbacks were quite generally profitable.

Paper-manufacturing does not appear to have taken much, if any part, in this expansion, and its development proceeded normally and if anything rather slowly. Nevertheless it could not escape from the general business depression that followed the war, mostly brought about by the flooding of the market with foreign goods under a policy which was declared openly in the British parliament to be quite worth while "in order by the glut to stifle in the cradle the rising manufactures in the United States, which the war had forced into existence, contrary to the natural course of things." Thus declared Lord Brougham, his

[182] *New Haven Columbian Register,* October 18, 1814.

"contrary to the natural course of things" being merely, intentional or otherwise, a euphemistic expression of "contrary to the interests of Great Britain."

Much of the investigating, debating and legislating in the early congresses of the United States pertained to the establishing and upbuilding of American industries and their protection from imperious foreign competition. The experiences of the colonial and revolutionary periods had not been forgotten by the generations that had come since then, and like problems seemed to be still pressing. In February, 1816, the secretary of the treasury, A. J. Dallas, at request of Congress, transmitted to that body a review of the existing tariff of the United States and a proposition for changes in the tariff duties. In this communication he divided the manufactures of the country into three classes, in the first of which, "manufactures which are firmly and permanently established, and which wholly, or almost wholly, supply the demand for domestic use and consumption," he placed paper of every description and blank books. In a schedule of articles to be imported free of duty under his proposed general tariff he placed "rags, of any kind of cloth," and advised a duty of thirty-five per cent. on "paper of every description, paper hangings, blank books, pasteboard, parchment, vellum and printed books." The duty then existing on paper was fifteen per cent., and the proposed duty represented an increase of 133⅓ per cent., a larger increase than that upon any other articles except clothing and woolens.[133]

During these years petitions continued constantly to come to Congress from all parts of the country urging prohibition of or increased duties on foreign manufactures, but these were not always immediately responded to in a manner effectively to meet the situation. The tariff acts of 1816 and 1818 were only measurably successful. Embarrassments, still in consequence of the unchecked importation of foreign goods, and the inflated and depreciated paper currency, continued to press heavily upon the

[133] Gales and Seaton: *American State Papers, Class III. Finance* (1832), III, pp. 85-93.

manufacturing interests and culminated, in 1819, in extreme business distress.

A memorial of the Society of Paper-Makers of the States of Pennsylvania and Delaware, of which Mark Willcox was president and Thomas Gilpin secretary, was presented to Congress in 1820, asking for further tariff protection. In this memorial it was stated that in the district represented by the society there had been erected seventy paper-mills, which were in full operation until interfered with by importations after the war. These mills had ninety-five vats which had cost to install about $500,000; they gave employment to nine hundred and fifty persons, half of them women and children, at a total amount of annual wages of $217,000; they consumed annually two thousand six hundred tons of rags, valued at $260,000, and produced about $800,000 worth of paper a year. Owing to the depression in business there were, in 1820, only seventeen vats working, paying an annual amount of wages of $45,000, having a production of $136,000 annually, and thus leaving unemployed seven hundred and fifty-five persons, with a loss of two thousand one hundred and twenty-eight tons of rags consumed, valued, $212,800, with loss of $624,000 in manufactured product. The memorialists asked that a duty of twenty-five cents per pound be imposed on all writing, printing and copper-plate papers and fifteen cents per pound on all others.[134]

Rags continued to be quite as indispensable and quite as difficult to procure, throughout this period, as they had been in the preceding generations. For more than a hundred years the education of the public in the importance of saving rags in order to have paper had gone on unremittingly, but still all that was desired and necessary in that direction had not been accomplished. The system of calling for rags from house to house, that lasted until well toward the end of the century, had been started and resulted in much, but not enough, and it was to be long before impor-

[134] Gales and Seaton: *American State Papers, Class III., Finance,* III., (1832), p. 462.

tations from abroad relieved the situation to any material degree. The tin-peddler with his wagon laden with tinware, and all sorts of other things for household needs, which he would swap for old rags, was a familiar sight in the country towns; in fact, he became for a time a national institution. Many are the "old boys" of the present generation who remember how as "young boys" they earned their first pennies for candy or for the circus by hunting and saving rags anent the coming of these itinerant barterers.

And yet withal the mills were constrained to continue, without relaxing, the same strenuous campaign that had gone on for years, begging for the wherewithal to keep their mills going. A few illustrations will sufficiently serve as examples of methods that were still pursued throughout the country. When Zenas Crane and his partners were ready to build the first mill in western Massachusetts this was the way in which they made known their intentions and their needs:

"AMERICANS!

"ENCOURAGE YOUR OWN MANUFACTORIES
"AND THEY WILL IMPROVE.

"LADIES, SAVE YOUR RAGS!

"As the Subscribers have it in contemplation to erect a paper mill in *Dalton* the ensuing spring; and the business being very beneficial to the community at large, they flatter themselves that they shall meet with due encouragement. And that every woman who has the good of her country, and the interests of her own family, at heart, will patronize them by saving her rags, and sending them to their Manufactory, or to the nearest Store Keeper; for which the Subscribers will give a generous price.

"HENRY WISWELL,
"ZENAS CRANE,
"JOHN WILLARD.

"*Worcester,* February 8, 1801."[185]

John Clark & Co., who leased and operated the first mill built in the Black river country, soon after 1807, gave

[185] *The Pittsfield Sun,* February 8, 1801.

notice that they wanted rags, which would be received for them in the principal stores in upper Canada and the Black river country. To their advertisement they added a poetic plea to the ladies to help them.

"Sweet ladies, pray be not offended,
Nor mind the jest of sneering wags;
No harm, believe us, is intended,
When humbly we request your rags.

"The scraps, which you reject, unfit
To clothe the tenant of a hovel,
May shine in sentiment and wit,
And help to make a charming novel.

"The cap exalted thoughts will raise,
The ruffle in description flourish;
Whilst on the glowing work we gaze,
The thought will love excite and nourish.

"Each beau in study will engage,
His fancy doubtless will be warmer,
When writing on the milk-white page,
Which once, perhaps, adorn'd his charmer.

"Though foreigners may sneer and vapor,
We no longer forc'd their books to buy,
Our gentle Belles will furnish paper,
Our sighing Beau will wit supply."[136]

Seth Hawley, a native of Connecticut, moved to Moreau, Saratoga county, N. Y., in 1793 and, in 1808, with his younger brother, Alpheus Hawley, erected there a paper mill. This was the fervid appeal that they put out in order to secure the necessary raw material for their enterprise:

"Save Your Rags!

"This exclamation is particularly addressed to the ladies, both young, old and middle aged, throughout the northern part of this state, by the subscribers, who have erected a paper mill in the town of Moreau, near Fort Edward. Nor is it thought that this appeal to our fair country women will prove unavailing when they reflect that without their assistance they cannot be supplied with the useful article of paper. If the necessary stock is denied the paper mills, young

[136] Franklin B. Hough: *A History of Lewis County in the State of New York* (1860), p. 181. *The Black River Gazette*, November 9, 1907.

SETH HAWLEY.

A Pioneer Paper-Manufacturer of New York.
Reproduced from an old engraving in Hawley's *The Hawley Record*.

> maidens must languish in vain for tender epistles from their respective swains; bachelors may be reduced to the necessity of a personal attendance upon the fair, when a written communication would be an excellent substitute. For clean cotton and linen rags of every color and description, matrons can be furnished with bibles, spectacles and snuff; mothers with grammars, spelling books and primers for their children; and young misses may be supplied with bonnets, ribbons and ear rings for the decoration of their persons (by means of which they may obtain husbands); or by sending them to the mill they may receive cash."[187]

Early in the century David Buel of Troy, who was one of the leading men in business and public affairs in that section of the state, and for many years postmaster, owned and operated a mill on Wynantskill. This was swept away by a freshet in 1814, but a few years later, on another site, he erected a second mill, which continued to be used under various owners for more than fifty years.[188] Buel had given active encouragement to the gathering of rags for the first mill near Troy in 1792, and now he found himself obliged to make similar earnest pleas on behalf of his own enterprise. This was the way in which he called for the paper-maker's staple:

> "*Please Save Your Rags.* The press contributes more to the diffusion of knowledge and information than any other medium; rags are the primary requisite in the manufacture of paper, and without paper the newspapers of our country, those cheap, useful and agreeable companions of the citizen and the farmer, which, in a political and moral view, are of the highest national importance, must decline and be extinguished. The paper mills of the State, could the poor and the opulent, the farmer and the mechanic, be persuaded into a laudable frugality of saving rags, would turn out ample supplies of American paper to answer all demands. The people of Massachusetts and Connecticut, with true American zeal, have introduced this exemplary saving into the economy of their

[187] Elias S. Hawley: *The Hawley Record* (1890), p. 479. Joel Munsell: *Chronology of Paper-making* (1876), p. 64.

[188] Arthur J. Weise: *Troy's One Hundred Years* (1891), p. 274. Arthur J. Weise: *Troy and Vicinity* (1886), p. 229.

houses. The latter, by fair circulation, makes yearly a saving of rags to the actual amount of $50,000. The ladies in several of the large towns display an elegant work bag as part of the furniture of their parlors, in which every rag that is used in the paper mill is carefully preserved. Were this example imitated, this State would not be drained of its circulating cash for paper and other manufactures which American artists can furnish. The poor, by the mere saving of rags, may be enabled to procure paper and books for school and family use and more agreeable articles of dress or consumption. The rich who regard the interests of their country will direct their children or domestics to place a bag or box in some convenient place as a deposit for rags, that none be lost by being swept into the street or fire, the sales of which savings will reward the attention of the faithful servant and encourage the prosperous habit of prudence and enterprise."[139]

In 1815 Cramer, Spear & Eichbaum of Pittsburg, Penn., were operating a paper-mill in connection with their printing and publishing business. In an announcement of this they put in the usual plea for rags:

"C. S. & E. have in complete operation their Paper Mill on Little Beaver, from which they will receive a constant supply of the various kinds of writing paper, wrapping paper, bonnet and fuller's boards, etc."

"*Rags! Rags!*

"We again entreat our economical and industrious housewives to take care that not an atom of this valuable article is lost.

"To them you are indebted for your bible, the education of your children; and the fair maid, however nice, in handling those *nasty* things, will have the means of holding a correspondence with what she holds most dear on this earth—a sweetheart—see how important.

"*For good clean* LINEN *and* COTTON *RAGS,* FOUR *cents in* CASH *and* FIVE *in* BOOKS, *is given per pound at the Franklin Head Bookstore.*"[140]

Until the new century was well under way importations

[139] Joel Munsell: *Chronology of Paper and Paper-making* (1876), p. 57.

[140] *Cramer's Pittsburg Almanac,* 1815.

of paper continued to be heavy despite all efforts to prevent it. Much of the writing paper of this period, as the correspondence that has been preserved gives evidence, bore the royal arms and other foreign watermarks. Letters of Harmar, St. Clair, Wilkinson, Wayne and others of the post-revolution period and later show this. Prior to 1820 the United States senate used paper that was manufactured in Europe; some of it had the water-mark, "Napoleon, Empereur et Roi, 1813." This use of foreign paper continued despite the offer of the Gilpin mills to furnish equally good paper at twenty-five per cent. less cost. About, or soon after, 1820 Simeon and Asa Butler of Suffield, Conn., supplied to the national senate the first American-made paper used by that legislative body.

Prices for paper were then high, all things considered. One record of the prevailing prices has been preserved in a report presented to the national house of representatives, in January, 1821, by the committee on manufactures. The committee favored imposing higher tariff duties for the protection of manufactures, and included in their report a statement of the kinds of paper then made in the United States, with ream weights and wholesale prices.

Kind of Paper.	Pounds Per Ream.	Value Per Ream.
Quarto post	7	$4.00
Folio post	16	9.00
Stout demy writing	22	10.00
Stout medium writing	28	22.00
Stout royal writing	34	16.00
Stout super-royal writing	40	18.00
Stout imperial writing	45	20.00
Foolscap writing No. 1	15	4.00
" " No. 2	13	3.50
" " No. 3	12	3.00
Demy " No. 1	16	5.00
" " No. 2	16	4.50
" " No. 3	16	4.00
" " No. 4	16	3.25
" " No. 5	16	2.75
Medium " No. 1	18	6.00

Medium writing	No. 2.....	18	$5.00
" "	No. 3.....	18	4.50
" "	No. 4.....	18	3.75
" "	No. 5.....	18	3.00
Royal "	No. 1.....	20	7.00
" "	No. 2.....	20	6.00
" "	No. 3.....	20	5.00
" "	No. 4.....	20	4.00
" "	No. 5.....	20	3.50
Super-royal	No. 4.....	22	4.50
Super-royal	No. 5.....	22	4.00
Imperial	No. 4.....	25	4.75
Imperial	No. 5.....	25	4.25

Fuller's press papers were generally sold at twenty cents per pound. Sheathing paper and paper used by sugar refiners sold for about eight cents per pound. Common wrapping paper, sold by the ream, was graded in different sizes, as cap, pot, crown, demy, royal, super-royal, and so on, and sold at from six to eight cents per pound. Tissue paper, used mostly for protecting copper-plate engravings in books, was commonly made on medium-sized moulds, weighed about six pounds per ream and was worth about six dollars per ream, commanding its high price on account of its being made in part out of new stuff. Super-royal printing was seldom finer than No. 4.[141]

Standard sizes of moulds used in the manufacture of hand-made paper were: Foolscap, 14¼x16¾ inches; littrice, 15¼x16¾; demy, 16x21; extra royal, 21½x25½; super royal, 20¼x27½; imperial, 22½x30½; post, 17x21½; medium, 18x23; royal, 21x24; manslaughter, 22x32; atlas, 26½x33. Bank paper was made foolscap. Papers were assorted into four grades, styled in the order of their perfection: whole, first retree, second retree, third retree or broken. Each ream consisted of eighteen quires of its particular grade and two quires of broken sheets, one on the top and one on the bottom of the ream. Newspapers were often printed on paper of the second or third quality.

[141] Gales and Seaton: *American State Papers. Class III., Finance*, III. (1832), p. 628

For some years after the erection of Joseph Markle's first mill at West Newton, Penn., Pittsburg was headquarters for the sale of all kinds of paper. An advertisement in Cramer's *Pittsburg Almanac*, for 1815, published by Cramer, Spear and Eichbaum, printers, booksellers and publishers of that city, gives the prices that prevailed at that time in that part of the country.

"C. S. & E. Having their PAPER MILL in complete operation, will be enabled to furnish at all times the various sizes and qualities of paper on the following terms:

Royal	Writing	$22 00	per ream.
Medium	do 1st quality	18 00	do
Medium	do 2nd quality	14 00	do
Demi	do	10 00	do
Folio	Post	9 00	do
Quarto	do	4 50	do
Fancy	do	5 00	do
Foolscap	No. 1	4 50	do
do	No. 1, retree	4 00	do
do	No. 2	4 00	do
do	No. 2, retree	3 50	do
do	No 3	3 50	do
do	No. 3, retree	3 25	do
Medium	Wrapping	2 75	do
Crown	do	2 25	do
Foolscap	do	1 75	do
Bonnet	Boards	9 50	per gross.
Fullers	do from 25 to 33½ per lb."		

CHAPTER SEVEN

A STEADILY GROWING INDUSTRY

THE FAMOUS AMES MANUFACTURERS AND THEIR WORK—FIRST MILLS IN BERKSHIRE COUNTY, MASS.—OTHER MILLS, OLD AND NEW, IN MASSACHUSETTS, CONNECTICUT AND ELSEWHERE—SCANT STATISTICS FROM THE FOURTH DECENNIAL CENSUS, IN 1820—OLD-TIME MILL EQUIPMENT AND OLD-TIME PAPERMAKERS

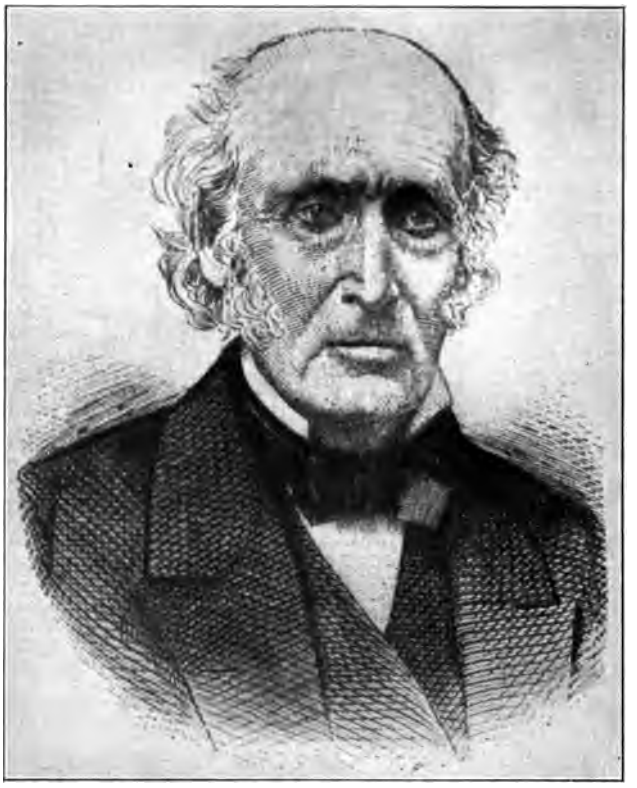
ADVANCED fully into the second century of its existence American paper-manufacturing had finally established itself in a fixed position among the foremost manual activities of the new nation. Compared with some other lines of business it was not yet predominantly important, in capital invested, in people employed, in raw material used or in annual output. Still, even though relatively small in those respects, no longer was it merely a local or neighborhood affair, as generally it had been in the past, save in the instance of those few mills that had achieved wider distinction by reason of success in growing bigger, in broadening their scope of operations and in extending their markets. In the census-taking of 1810, it was one of the twenty-three industries specifically included and only ten stood ahead of it in the value of its manufactured product. It ranked below woollen, cotton and silk goods, machinery and carding-cloths, hats, manufactures of iron, manufactures of gold and silver, soap and oil products, manufactures of hides and skins, liquors, manufactures of wood, and cables and cordage. It was superior to soap and oil products, refined sugars, glass and earthenware, and tobacco.

When, as down to the breaking out of the revolution, less than twenty mills in eight colonies—and those mostly indeed in Pennsylvania and Massachusetts—had covered the entire industry, the particular, detailed history of those several establishments, even though only few of them ever rose to commanding importance, was, in the largest sense, a comprehensive history of the whole. Now, however, the individual mill, save in exceptional instances, began to count for less than heretofore, for its conspicuous and influential identity was merged in the broader considerations of the entire institution. The industry had grown and expanded beyond the measure of any of its single representatives, was gradually becoming more and more of national consequence, was making a not insignificant part of the history of the country, was affecting and being affected by others, and was exercising a considerable and steadily increasing influence upon the life of the people. It became involved in the questions of the tariffs; it was often a prime factor in establishing and assisting in the growth of new communities.

It is in these later aspects that the history of the industry becomes more impressively interesting and more vitally important. From this point on the record is one of development in widely separated parts of the country, of the opening of new paper-manufacturing centers, of the introduction of machinery and of improvements in methods. This ripening growth covered the best part of the first half of the century, before the industry began to show that it was soundly on the way to being fully rounded out and substantially established in its modern conditions.

Notwithstanding the census of 1810 and the personal investigations made by Isaiah Thomas, about the same time, indicated that the number of mills in the country was approximately one hundred and eighty to two hundred, the actual number existing in this period continued to be more or less an unknown quantity. Several things contributed to this paucity of accurate information. Most of all, in the majority of cases the mills were small affairs and existed only temporarily; they sprang up almost in a night, as it were, were burned in a few months, or a few

years and were not rebuilt. In their way they were as hard to find and as hard to keep track of as the proverbial elusive flea. Some of them, however, stand out conspicuously, as they were eminent in size, in magnitude of operations and in financial solidity or were founders of sectional manufacturing centers; and as such they command special attention. Perhaps two score of them, all told, were



DAVID AMES.
A Famous Pioneer Paper-Manufacturer of Massachusetts.

of such consequence in the first quarter of the century, mainly in Massachusetts, New York, Pennsylvania and Delaware.

For a period of nearly forty years the Ameses of Springfield, Mass., were great paper-manufactures. David

Ames, a soldier of the revolution, was sent to Springfield, in 1794, in the second presidential term of Washington, to estabish the national armory in that place, being commissioned a colonel. After eight years in that position he resigned and went into the business of paper-manufacturing, purchasing a mill which had been built in Springfield about 1800. This mill was the regulation small affair, having two vats and two rag engines, each of one hundred and twenty pounds capacity. The machinery was mostly of wood, and power was derived from an undershot wheel. It was not until 1820 that iron gearing was put in and by that time its capacity had nearly doubled.

Sons of the original proprietor, David, Jr., and John, were admitted to partnership and the firm entered upon a career of prosperity. John Ames was the inventor of the family and a cylinder machine and other devices and processes originated by him contributed much to their success. From the outset the firm, which became known as D. & J. Ames, prospered wonderfully, making money rapidly and growing until it was one of the largest and most powerful in the country. They purchased mills that had been established near Springfield and also built a twelve-engine mill in South Hadley Falls. At one time they operated five mills, were running sixteen engines, were using three tons of rags daily and producing eighty reams of the largest size printing paper and one hundred and eighty reams of foolscap or letter.

One of the best properties acquired by the Ameses was on the Chicopee river in that northern part of Springfield which later became the town of Chicopee. There, in 1806, a mill was built by William Bowman, Benjamin Cox and Lemuel Cox, who continued to manufacture paper for fifteen years or upward. Chauncey Brewer and Joshua Frost bought the property and maintained the mill in operation for five or six years more, when they sold it to David Ames. Machinery was introduced by the Ameses, who were succeeded, in 1853, by John Valentine. Thus the mill was operated for nearly or more than half a century.

The product of the Ames mills was book, news and

writing and the members of the firm were credited with being particularly shrewd and sometimes not over-scrupulous in manufacturing and business methods. It has been said that all kinds and grades of paper made by them were produced from the same stock and by the same process. Their book and news sold for nine cents a pound, and at times it was cut up, ruled and sold as writing for eighteen cents a pound. When rags became high in price they bought cardboard shavings in New York at two and one-half cents a pound, worked them with rags and sold the paper made from this stock at twenty-five cents a pound.

About this time some manufacturers in England devised a method of loading their pulp with sulphate of lime or gypsum to an extent of twelve per cent in order to give weight to their paper. This practice soon became known in Europe and in the United States, and the Ameses have been credited with adopting it in some of their mills, according to the testimony of a later-day manufacturer who, as a boy, was one of their apprentices.

> "One way they had of adding weight was from an old gypsum mine near their Water Shops mill in Springfield. This they mined and crushed with a crude grinder, and after screening a little, wheeled it to the side of the beaters and shovelled in all they thought the stuff would carry. One of the effects of this kind of pulp was to make the paper quite gritty, almost like very fine sand paper. The old cylinder machine with one large fire dryer was run about twelve hours per day and during this time the gypsum would accumulate on the dryer so thick that very little heat could get through it. A good strong scraper was then employed to clean it and the machine was ready to go ahead again." [142]

During the panic of 1837 the Ameses met with disaster, and, after dragging along in a crippled financial condition for a few years, sold their property. Their original mill in Springfield was purchased by Greenleaf & Taylor, and finally was destroyed by fire. David Ames, Sr., died August 6, 1847, aged eighty-seven years. His son, David

[142] George W. Thompson: in *The Paper Trade Journal*, October 16, 1897.

Ames, died March 12, 1883, aged ninety-two. John Ames died January 25, 1890, aged ninety.

Now were the beginnings of that paper-manufacturing which ultimately made the western part of the state of Massachusetts one of the centers of the industry in the United States and internationally celebrated. The starting of a little mill in Berkshire county, in 1801, was apparently no more important than hundreds of similar undertakings that had preceded or were to come after it in all parts of the country. Ordinarily it would have been only an almost insignificant local event to be passed by indifferently in any historical review of the subject.

But the man and the place contributed to achieve for it more than simple neighborhood fame. It was the precursor of big things in its following; it blazed the way for a century of surpassing paper-making development; it laid the foundation for establishments that have had no superiors and few rivals in their respective lines. As a pioneer and as a powerful influence in leading and developing, under favorable conditions, a notable part of the industry to which it belonged, the little Dalton mill rightly commands something more than mere casual notice and takes a conspicuous place as an historical landmark.

Twenty-three years before, in 1779, the people of the town of Pittsfield were impressed with the importance of having paper made in their part of the state. In town meeting they voted instructions to their representatives to the great and general court in Boston, to use their "best endeavors, that any petition which may be preferred from this town, or from any individual of it respecting the erecting a Paper-mill in this town, be attended to and espoused by you in the General Court." Nothing seems to have been done about this at the time, however, and it was after 1800 that the desired paper-mill for the extreme western part of the state was a reality.

Zenas Crane, the pioneer paper-manufacturer of the Berkshires, came from the eastern part of Massachusetts, the home of his parents being in Canton, Norfolk county, in the neighborhood of the first Massachusetts paper-mill of 1728 in Milton. His elder brother, Stephen Crane, Jr.,

learned the trade in that mill and then established himself a few miles away in Newton Lower Falls. In the Newton mill the younger boy acquired the rudiments of the business. From Newton he moved on to Worcester, where he worked for some time in the mill of General Caleb Bur-

Founder of Paper-Manufacturing in Berkshire County, Mass.

bank. There he had wider experience and gained a more thorough knowledge of the details of his chosen vocation.

Having reached this stage of preparedness, he determined to have a mill of his own and to this end, in 1799, when he was twenty-two years of age, he journeyed to the

western part of the state, and there, in the town of Dalton, selected a site for the first paper-mill in Massachusetts west of the Connecticut river. Not until two years later was the mill built, as appears from an advertisement for rags, printed by Crane and his two partners in the *Pittsfield Sun*, February 8, 1801.[148]

John Willard dropped out of the firm before the enterprise was fully started, Daniel Gilbert taking his place. In December, 1801, a mill had been erected on a lot of land a little more than fourteen acres in extent, with a water privilege and for this they paid one hundred and ninety-four dollars. The building was a one-vat mill, with a drying loft in the upper story, and it had a capacity for day's work of twenty posts—one hundred and twenty-five sheets of paper. Various sizes of book and news papers were made, but the writing paper was in foolscap and folio only. Two newspapers of the county used most of the news that the mill produced, and the overplus, both of writing and printing, went to the nearby market in Albany. For several years the annual production was about twenty tons. Mr. Crane was the superintendent and general manager and had a weekly salary of nine dollars.

In 1807 Mr. Crane retired, selling his interest in the mill to his partners, but three years later he came back into the business and bought part of another mill—the second in Dalton, built in 1809. This became famous as the Old Red Mill and in 1822 Mr. Crane became sole proprietor of the business, maintaining his active control of it until 1842, three years before his death. Further account of the Old Red Mill and its successors belongs in the history of the Cranes of three generations and their notable activities in the field of paper-manufacturing.

After 1807 Wiswall & Carson owned the first Dalton mill. In subsequent years it was managed by David Carson, his sons, Thomas G., William W., and David J., all of them expert paper-makers and, still later, down to contemporaneous times, principally by other members of the Carson family.

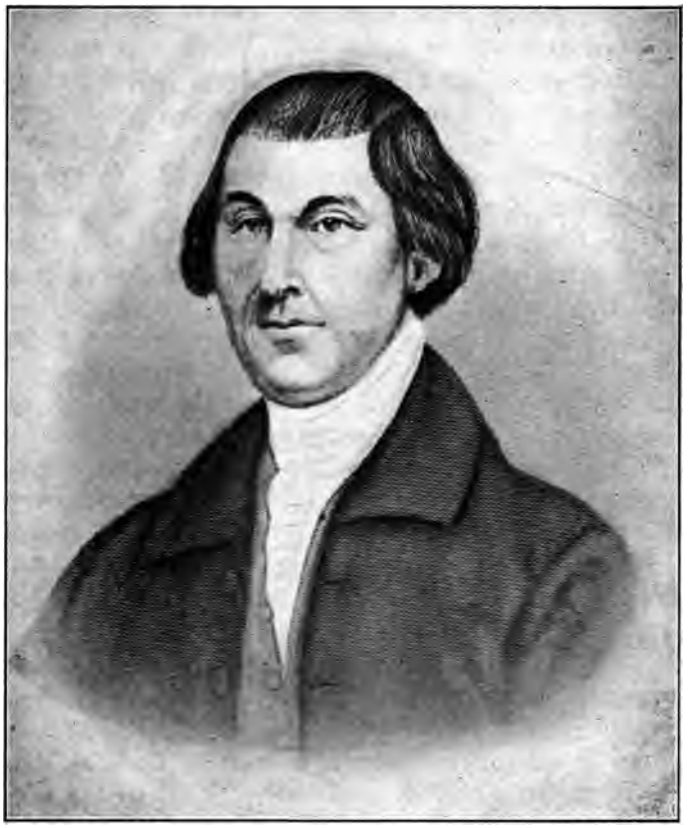
[148] See page 114, *ante*.

DAVID CARSON.
A Pioneer Paper Manufacturer in Western Massachusetts.
Reproduced from an old wood engraving.

After the start had been made by Zenas Crane and his associates paper making in the Berkshires went steadily on, though slowly at first. News of the natural advantages of the section spread and especially did the excellence of waterpower that could be secured, the salubrity of the mountain air and the purity of the water peculiarly adapted to paper making, command the attention of paper-makers who presently began to journey thither. Samuel Church came from East Hartford, Conn., to the town of Lee in 1806 and built there a two vat mill and two years later Lemuel Church built another mill in Lee, the third in the county. No further additions were made to the industry in this little town until 1827 when Charles M. Owen and

Thomas Hurlbut arrived and began to manufacture in one of the Church mills in a small way, employing four men and six women and producing ten reams of letter paper a day. Their energy and natural ability led to the rapid expansion of their business and they were soon in the forefront; but that is a story of a later period.

Between 1810 and 1825 there were in existence, at different times, in Massachusetts, from twenty to thirty mills, possibly a few more. Aside from those already referred to in Springfield, Dalton and Lee they were principally located in Milton, Newton, Waltham and Worces-



DANIEL VOSE.
One-Time Owner of the Mill in Milton, Mass.

ter. Most of them were small and scantily equipped and—established only to meet local needs—perished when the conditions altered that gave them birth. Several, however, were more enduring and have lasted into the twentieth century with little if any material change except as has resulted from the introduction of modern machinery and the expansion of business.

After the passing of a hundred years the first mill in Milton still remained active, although it had been long out-distanced by some of its more pretentious later rivals, in size and importance of operations. Daniel Vose, the son-in-law of Jeremiah Smith, had acquired the property from his father-in-law about the time of the revolution and held it nearly until his death. Vose, who was born in Milton in 1741 and died there in 1807, was, during the greater part of his mature life, the leading business man of his native place and active in civil and military affairs. He was in every way a worthy successor to the first paper-mill men of Massachusetts.

John Sullivan and Joseph Dodge operated the mill for a few years but it was later leased to Isaac Sanderson of Watertown, who in 1810 acquired ownership of it. Sanderson was an experienced paper-maker and a clever inventor. In 1803, according to a local historian, he manufactured for the Boston custom house the first folio post and quarto letter paper ever made in New England. In 1817 he built a new mill near the old one and put in a wrought iron tub-wheel, the first iron water wheel used in that section. He retained control of the mill until 1834.[144]

By succession to Jeremiah Smith Boies and Hugh McLean, the business in two of the Milton mills passed into the hands of Amasa Fuller, George Bird, Henry Cox, Richardson Fuller, Benjamin F. Crehore, Jarvis Fenno, Ebenezer Steadman, Joseph Randall and John Savels, through a period of nearly thirty years. The McLean property was purchased by Edmund Tileston and Mark Hollingsworth, in 1809, and that of Boies by the same partners, in 1828. Tileston and Hollingsworth thus came

[144] Albert K. Teele: *The History of Milton, Mass.* (1887), p. 371.

into possession of both these historic mills which they proceeded to enlarge and remodel, thus laying the foundation of the business that was to endure as a family possession unbroken for another hundred years.[146]

In the eastern part of Massachusetts, Middlesex county had developed manufacturing on a large scale along widely divergent lines. Paper-manufacturing was established in several towns during the last quarter of the eighteenth century and in the first quarter of the next century. There were mills in Waltham, Ashland, Newton, Watertown, Shirley, Framingham and Pepperell. In Newton only did the industry grow to notable proportions, but the operations in other places were not devoid of interest.

A little mill in Waltham was the third in that town, built by Nathan and Amos Warren in 1802. Located on Stony brook, a stream that branches off the Charles river, it became the property of John Gibbs about 1820. In 1835 John and Stephen Roberts purchased the mill, Stephen Roberts having had practical experience in several Massachusetts mills. In a few years John Roberts became the sole proprietor and in his hands and those of his descendants the mill has remained until the present time. For more than half a century it was operated by John Roberts and his son William Roberts and now—in 1916—is owned and operated by The John Roberts & Son Company, Incorporated. The mill, which years ago superseded the original wooden structure that was burned in 1844, is a picturesque stone building, old-fashioned in appearance but modernly equipped, in a country suburb of the city that has been known there for several generations as Roberts' Station.

The record of this mill, as it was conducted in the hands of its long-time proprietor, is another illustration of the success that in early days came to many a small establishment skillfully operated on a specialty. John Roberts was one of the first American manufacturers to introduce the Fourdrinier machine and he added improvements in machinery and new methods of his own devising. Among

[146] Albert K. Teele: *The History of Milton, Mass.* (1887), pp. 372-375.

his inventions was a machine for tarring sheathing-paper used for building purposes and the Roberts mill soon became widely known for its high grade of standard tarred paper. At one time the mill was almost exclusively occupied with this product. Beginning with coarse wrapping paper Roberts was shortly one of the first manufacturers

JOHN ROBERTS.
Proprietor of one of the first mills in Waltham, Mass.

in the country to make fine grade hardware papers. In 1916 the mill was making asbestos paper, a logical advancement from the original tarred roofing paper.[146]

[146] D. H. Hurd: *History of Middlesex County, Mass.* (1890), III., p. 757.

Jonas Parker and Thomas Parker, natives of Shirley, learned paper-making in one of the Waltham mills, and returning home built the first mill in that town, on the Catacoonamaug river. It was an humble effort with one vat and one engine. Later came a larger establishment built by Edgarton & Co., the senior partner of this firm having had an interest in the first mill. Special distinction attached to this mill through the skill of its superintendent, Henry P. Howe, who conceived the idea of fire-drying as a substitute for the old-fashioned, slow air-drying process. His fire-dryer machine was patented and put into operation with eminently satisfactory results. Howe gave up paper-making and engaged in the manufacture of paper-making machinery. The fire-dryer, which had promise of great results, was finally superseded by the steam-drying process. The Edgarton mill, under different operators, continued until 1837 when it was destroyed by fire. Another mill erected on the site was operated for some ten years, to about the middle of the century, when it was burned and the manufacture of woollen goods was substituted for that of paper.[147]

When John Ware, from Sherborn, established himself at the lower falls in Newton, in 1789, he purchased fourteen acres of land including a dam, water courses, mills, a forge, a dwelling-house and a barn. Only a small part of his investment was the paper-mill which he built the following year, but this was the beginning of what made Newton Lower Falls a great paper-manufacturing place. During the next forty years many changes were made in the ownership of this and other properties dependent upon the water-power of the Charles river at this point. Between the years of 1812 and 1832 upwards of thirty sales and transfers were made. An adjustment of the differences existing between the various owners, regarding water-rights, was made in 1816 and it appeared that then there were five paper-mills, the owners of which were Simon Eliot, Solomon Curtis, William Hurd, Moses Grant, John Ware, and Charles Bemis, Eliot &

[147] Seth Chandler: in *History of Middlesex County, Massachusetts* (1880), II., p. 299.

Curtis and Hurd & Bemis being two partnership concerns. It was nearly twenty years subsequent to this date when paper-manufacturing in this village fully entered upon the career that made its history such a large part of the

SETH BEMIS.
A Later Proprietor of an Early Massachusetts Mill.

industry in contemporaneous times in the hands particularly of the Crehores, Curtises and Rices.[148]

Seth Bemis, who was born in 1775 and died in 1851, was the youngest son of David Bemis. He succeeded his father

[148] D. H. Hurd: *History of Middlesex County, Massachusetts* (1890), III., p. 102.

and his brothers in the manufacturing enterprises of the family on the banks of the Charles river in Watertown and Newton, owning the paper-mill at Bemis Station after 1821. But his greater business success was in the manufacturing of cotton and woollen goods and the preparation of dye-stuffs.

Despite many discouragements the mill in Andover owned by Samuel Phillips and Thomas Houghton managed to exist in fairly prosperous condition until into this century. It stood for twenty years, being burned in 1811. Rebuilt in the following year, it was producing, in 1829, paper to the value of $10,000 annually and was giving employment to sixteen to twenty persons. Sons of Phillips and Houghton succeeded their fathers in the business, but after 1820 the mill passed into possession of others and finally became the property of Amos Blanchard, Daniel Poor and Abel Blanchard. Ultimately it was transformed into a woollen mill and paper-manufacturing in this town ended.[149]

Changes occurred in the ownership and operation of the first mills that had been started in central Massachusetts. Abijah Burbank, who built the mill in Sutton before the revolution, was in time succeeded by his son, General Caleb Burbank, who associated with him his brother, Elijah Burbank. Under these brothers the property was greatly improved and its capacity enlarged. With the advent of machinery, cylinders were put in and rag cutters, tub-wheels and new engines so that between 1828 and 1835 it was quite an up-to-date establishment. General Burbank was a notable figure in his generation, a publisher, a man of diversified business interests, influential and wealthy. But trouble came in the financial panic of 1836 and with many others the Burbanks went under. The mill passed into other hands but was operated until nearly the opening of the civil war.

The Thomas mill, which had become another Burbank property, was, after about 1811, owned solely by Elijah

[149] Abiel Abbott: *History of Andover, Massachusetts* (1829), p. 195. S. F. Bailey: *Historical Sketches of Andover, Massachusetts* (1880), p. 585.

Burbank who made wrapping paper in it. He ran the mill until 1834 when the Quinsigamond Paper Company purchased it and, putting in new machinery, turned it to its initial purpose of producing printing paper, making about three hundred reams per week.

The mills of Providence, R. I., endured well into this century. Those owned by Christopher Olney became the

MAJOR-GENERAL CALEB BURBANK.
An Early Paper-Mill Owner in Central Massachusetts.

property of Wheaton & Eddy after the death of the original proprietor and finally they were owned by Richard Waterman. In a short time, however, they were discontinued.

Another historic eighteenth century mill that existed in one form or another for nearly a hundred years was that of Colonel Matthew Lyon in Fairhaven, Vt. After 1800 it passed out of the hands of James Lyon, son of Colonel Lyon, and was owned by Josiah Norton. Burned in 1806, it was rebuilt and lasted until 1831, when it was again burned and again rebuilt. It endured until well toward the end of the century, but at the last in a very small way.[150]

The third mill in Maine followed those that had preceded it in Falmouth by more than eighty years. It was in 1811 or 1812 that Robert H. Gardiner and John Savels started this in the town of Gardiner, on the Cobbassee river. Gardiner owned the mill site and Savels, who was the practical man, having learned his trade in one of the mills of Milton, Mass., managed the business. The output was writing paper. In 1820 Gardiner sold his interest in the property to his partner. Savels died in 1824 and under various ownerships and managements the mill continued to be operated until after the middle of the century. Other Maine mills started in this period were: that of George Cox & Co.—Cox being from the Milton mill—built, in 1823, on Seven Mile brook in Vassalborough, and burned in 1843; that of Harris & Cox and Rand & Stockbridge in North Yarmouth from 1816 to 1836, and that of Joseph F. Day in Union from 1816 to 1843.

General David Humphreys, of Seymour, Conn., was one of the most energetic Americans of post-revolutionary times in encouraging in a practical manner the manufacturing industries of the country. He was a Yale graduate, a general in the revolution, the first United States minister to Portugal, in 1791, and minister plenipotentiary to Spain from 1798; he was also a poet as well as a soldier and

[150] H. P. Smith and W. S. Rann: *History of Rutland County, Vermont* (1886), p. 604.

diplomat. When he returned home from Spain in 1802 he brought a herd of choice merino sheep and engaged actively in raising wool and in woollen manufacturing in his native state. His woollen mills were the beginning of the village of Humphreysville to which he gave his name. To his other enterprises he added a paper-mill in 1805 and,

GENERAL DAVID HUMPHREY,
Soldier, Diplomat, Poet and Manufacturer.

starting it in operation in a very modest way, produced from it four or five reams per day for several years. Subsequently the mill passed through the hands of several owners, and news, tissue and other papers were made in it. In 1850 it was torn down and a successor to it, erected on another site a short distance away, was burned in 1885 and not rebuilt.

A STEADILY GROWING INDUSTRY

In the southern part of Connecticut, where Christopher Leffingwell built the first mill in the colony in 1766, not much more interest was manifested in this industry until well into the next century. Between 1790 and 1800 Andrew Huntington put up a mill on the Yantic river in Norwich, near or on the site of the old Leffingwell mill, and some years later Amos H. Hubbard owned and operated a mill in the same town, achieving the distinction of installing there, in 1830, the first Fourdrinier machine in that section of the state. First alone, then for twenty years

THE HUMPHREYSVILLE PAPER-MILL.

A Wood Engraving on Wrappers for the Paper Made in the Mill. Reproduced by permission from Campbell, Sharpe & Bassett's *Seymour, Past and Present.*

in association with his brother Russell Hubbard, he continued in the business until 1857, part of the time operating two mills.

It has been estimated that by 1820 the annual average production of the paper-mills of the United States was about $3,000,000, the cost of materials and labor in the manufacturing about $2,000,000, the number of persons employed five thousand, of whom one thousand seven hundred were males over sixteen years of age, the others

women and children.[151] Undoubtedly these figures were largely guesswork, for then there was no possible way to obtain accurate information in regard to the industry. The failure of the manufacturing statistical part of the census of 1810 has been pointed out and other investigations afforded no surer basis for conclusions.

A second attempt was made in the taking of the fourth census, that of 1820, to gather more complete industrial statistics than before, but the effort was again dolefully unsuccessful. The schedules were calculated to enumerate the number of establishments in the several counties of the states; the nature and names of the articles manufactured; the market value of the annual product; the kind, quantity and cost of raw materials annually used; the number of persons employed; the total quantity and kind of machinery installed and the quantity in operation; the amount of capital invested; the amount of annual wages; the amount of contingent expenses, and general information regarding the establishments, conditions of business, and so on. In the final summing up, however, many mills were not reported, others declined to supply complete information, others refused to furnish any information whatsoever, the enumerators often failed to fill the blanks and the actual number of mills is nowhere given. A reading of the tabulation from the facts and figures collected by the enumerators, can at the best give only an approximate idea of the condition of any industry that may be examined, or, as for that matter, of the manufacturing of the country as a whole.

In respect to paper-manufacturing quite as markedly as in the case of other industries the report was inaccurate and inconclusive but nevertheless it is not wholly devoid of interest and value, when allowance has been made for its many shortcomings. It is not necessary to analyze the report in detail, but an examination of the tabulated returns for two of the states will sufficiently illustrate how inefficient and unreliable were the returns everywhere.

[151] Joel Munsell: *Chronology of Paper and Paper-Making* (1876), p. 73.

In Massachusetts, for Middlesex county, the amount of the annual product is given at $55,392, the machinery used, nine engines, eight vats, moulds, etc., and people employed, one hundred and seven, but the number of mills is not stated, although it is known that probably a dozen or more were then in operation there. In Worcester county the annual product is given as $23,160, with four vats, three presses and three engines, and the people employed, thirty-seven, but the number of mills is not designated. Norfolk county is credited with an annual product of $25,000 "in part," and fifty-eight persons employed in two mills with two vats, two water wheels and five engines; a note refers to operations in three establishments and no statements from some others. In Hampden county it is said that six vats and other machines are in operation, employing sixty-nine people, but the number of mills is not given. For Hampshire county it is stated that thirty-five persons are employed in mills equipped with "vats and engines" and annually producing to the value of "$5,000 in one of these establishments; the others not stated"; and how many others does not appear. In Berkshire county three mills are reported in part, in spite of the fact that paper-making was already assuming considerable proportions in that county.

The statement for Rhode Island is quite as non-illuminating. In the tabulation one paper mill is entered as producing annually twenty reams of writing and twelve of wrapping paper per week, and without other information. A foot note adds:

> "There are, besides what has been stated . . . two paper-staining manufactories, the business of one of which is dull, from the markets being overstocked with French papers, and the other, from the same cause, is not in operation. . . . There are likewise . . . a paper and an oil mill. . . . To which may be added a manufactory of paper . . . three manufactories of hats, and two of paper: all of which are stated as not in operation, except the paper manufactories, with respect to which, however, no particular information could be obtained."

As the final classification and digest was made and

printed under the direction of congress[188] the mills in the several states were set down as follows: Maine, one; New Hampshire six; Massachusetts eleven; Rhode Island, six; Connecticut seven; Vermont one; New York,

Samuel Phillips

Proprietor of the First Mill in Andover, Mass.
Reproduced from a steel engraving in the *New England Historical and Genealogical Register.*

twenty-one; New Jersey, four; Pennsylvania, twenty-four; Maryland, five; District of Columbia, one; North Carolina, one; East Tennessee, two; Kentucky, one; Ohio,

[188] Gales and Seaton: *Digest of Accounts of Manufacturing Establishments in the United States and Their Manufactures* (1823).

four; total, one hundred and three. This accounts for only about one-half the mills that were in existence in 1810 and certainly for not more than the same proportion of those that were undoubtedly being operated in 1820. The number of employees reported were two thousand and seventy; in Maine, twenty-four; New Hampshire, forty-eight; Massachusetts, one hundred and thirty-eight; Connecticut, two hundred and five; Vermont, one hundred and forty-one; New York, three hundred and seventy-three; New Jersey, one hundred and fourteen; Pennsylvania, six hundred and fifty-nine; Maryland, one hundred and thirty-two; District of Columbia, twenty; North Carolina, eight; East Tennessee, sixteen; Kentucky, sixty-four; Ohio, one hundred and twenty-eight. This was manifestly not more than one-half the actual number; and the total amount of annual product, given as $957,902, and the amount of capital reported as invested, $1,672,839, were both manifestly absurd underestimates. The Munsell calculation was probably much nearer the truth than the faulty census. No mills were reported in Virginia, Georgia, South Carolina, West Tennessee, Arkansas, Indiana, Illinois, Minnesota and Michigan.

Until after the first quarter of this century had nearly passed machinery as the word is understood in modern times was unknown. Water-wheels and beating engines were part of the equipment of every mill, but that was the end of labor-saving devices; all else was the primitive hand-work such as had prevailed alone through generations of paper-making. Some mills still remained in the one-vat class, but most of them had at least two vats, while not a few could boast of three or even four vats.

An average two, three or four-vat mill represented an investment of from $3,000 to $8,000, the lesser figure more generally than the larger. It was the rare exception when a mill could be considered to be worth $10,000. Reports of the burning of mills from time to time mostly put the values at $3,000 to $6,000, but a mill on the Bronx river, in the suburbs of New York city, owned by David Lydig, was insured for $32,000 when it was destroyed by fire in 1822. This was considered a costly establishment, being

well-equipped and carrying a large quantity of paper stock. The mill of the Gilpin brothers on the Brandywine river and several of those of the Ames family in and about Springfield, Mass., were also valued at high figures, the Gilpin at from $350,000 to $500,000 and the entire Ames plant at fully as great an amount if not more.

To man a one-vat wrapping paper-mill required four men and a boy; twenty posts was a day's work, requiring about nine hours' labor for two men and a boy at the vat; one hundred and twenty-six felts or one hundred and twenty-five sheets constituted a post, so that two thousand five hundred sheets were turned out daily. A good two-vat mill could be depended upon to produce two thousand to three thousand reams of all kinds of paper annually, with twelve or more workers—men, women, boys and girls. In the collecting of rags and other raw material and in the making of the paper, two thousand five hundred persons found employment. Rags, junk, old sails, rope and other raw material were used to the amount of three thousand five hundred tons or more annually. A four-vat mill could turn out every day about four hundred pounds of hand-made paper which commanded a price of from forty to fifty cents per pound.

Most of the small mills were at first run by the owners with help employed from the neighborhood. Gradually, as the industry expanded and the demands upon the mills for paper increased, a class of professional paper-makers sprang up and the mill proprietors came more and more into dependence upon them. They were a wandering lot of vagrants very much like the old-time tramp printers, and in fact many of them were veritable tramps, travelling about the country from mill to mill as they might wish to have employment.

It was a great accomplishment to be a good vat-man, one who could hold the mold with its fibre and water level and thus make a perfect sheet of paper, of uniform thickness. The men began work in the mills early in the morning, stopping for breakfast and particularly taking a rest at grog-time, about eleven o'clock in the forenoon. A day's work of twenty posts was generally finished

early in the afternoon and then resort was had to the village tavern for the rest of the day. These professional paper-makers could be distinguished from other workmen by their big red hands, the result of dipping their hands continually into the warm water and pulp, and by their stooping, round shoulders caused by constantly bending over the vat.

THE ECKSTEIN MILL, MANAYUNK, PHILADELPHIA.
Reproduced from an old wood engraving.

CHAPTER EIGHT

IN MIDDLE AND SOUTHERN STATES

BEGINNING IN CENTRAL AND NORTHERN NEW YORK—MILLS THAT ENDURED SUBSTANTIALLY UNCHANGED FOR A HUNDRED YEARS—THE FAMOUS MILL OF THE GILPIN BROTHERS IN DELAWARE—NEW MILLS IN WESTERN PENNSYLVANIA—PLANTING THE INDUSTRY IN OHIO, KENTUCKY AND TENNESSEE

PAPER-MANUFACTURING went on apace in New York, although in that State there were very few mills that had attained large size or that were making very much impression. The industry was still in the hands of single individuals or small firms, not yet having become big enough to warrant its advancement into the higher field of incorporated business, although the trend toward incorporating had generally set in. According to a report made to the United States government in 1823 by the secretary of state of the commonwealth, two hundred and six incorporated companies were there then engaged in manufacturing in New York, of which number two only were producing paper. At that time there were undoubtedly close on to forty mills in the state.

The pioneer mill in western New York was built in Dansville, Livingston county, by Nathaniel Rochester. Dansville was then just emerging from the frontier stage of settlement, and Rochester, a North Carolina man, a colonel in the revolution and a friend of Washington, came there in 1810, purchased land and mill property and erected the paper-mill. The establishment was evidently of small account, for Colonel Rochester sold his entire

interests in 1814, comprising seven hundred acres of land, a grist-mill, a saw-mill and the paper-mill for $24,000. It was, however, the beginning.[154]

Other mills were early erected in Dansville, and among

NATHANIEL ROCHESTER.
The First Paper-Mill Owner in Western New York.
Reproduced from an old engraving in O'Reilly's *Sketches of Rochester.*

them was one that became historically celebrated by its continuance for nearly one hundred years practically unchanged in its pristine, primitive character. This was the

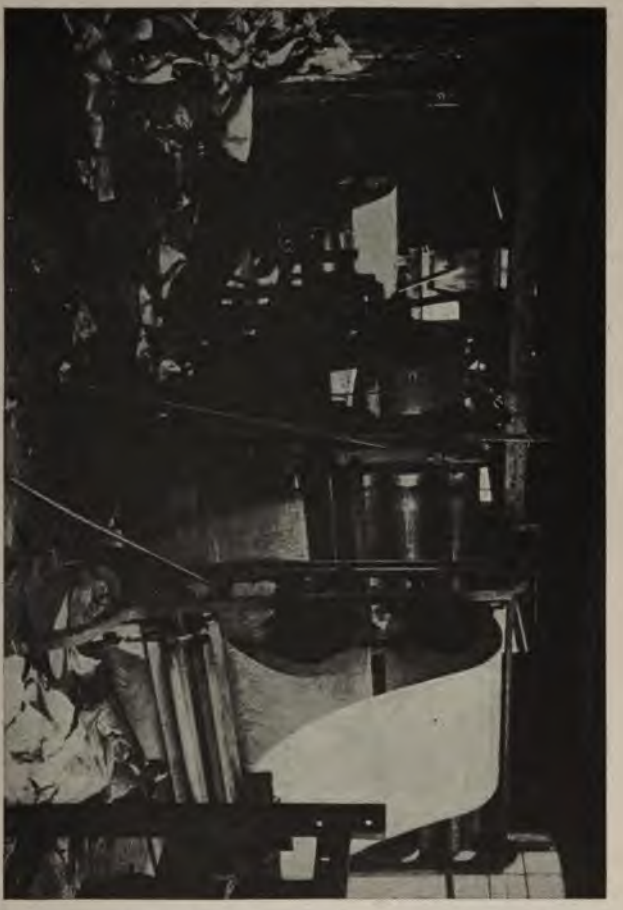
[154] A. O. Bunnell: *Dansville,* 1709-1902, pp. 34 and 78.

Eagle, built in 1824 by Andrew Porter, at the entrance to Poag's Hole valley. In the fading years of its century of existence the Eagle was a weather-beaten wreck of an old wooden building more picturesque than business-like. From the same brook that flowed by it in 1824 came the

THE EAGLE MILL, DANSVILLE, N. Y.—EXTERIOR.
Reproduced by permission from an engraving in *The Inland Printer.*

water that operated it after 1900, and, in the modern days of gas and electricity, such meagre light as it needed was furnished by old-fashioned oil lamps. No better picture of this antiquated mill could be drawn than the description made by one who visited it when it had nearly reached its nine score years of existence.

"The machine on which the paper is made is said to have been built by a local wheelwright, a slender wooden affair of barely twenty feet in length and thirty-six inches in width. The entire plant is operated by water-power, its huge, old wooden water-wheel creaking noisily under its ceaseless burden. The



THE EAGLE MILL, DANSVILLE—INTERIOR.

Reproduced by permission from an engraving in *The Inland Printer*.

dam, from which the water is drawn, is one of those old-fashioned affairs which, owing to the scarcity of the supply, exposes shamelessly its structural features to the public gaze. A wooden flume, perched above the ground upon scantling supports, carries the water to the mill, a hundred yards distant, leaking copiously all the way. There are two beaters, each of a capacity

of about two hundred and fifty pounds, located in the loft, and the pulp runs into a vat below, from which it is pumped up to the machine.

"The machine is in every way singularly deficient in labor-saving devices. The pulp is carried on a blanket instead of a Fourdrinier wire, which permits the water to percolate through. There are but four small heated cylinders, instead of the huge batteries of dryers seen on even the smallest of modern machines. There are neither suction boxes, calendering rolls nor cutting disks, and the water, as it is pressed from the pulp, is permitted to drip about the machine with heedless prodigality.

"The reel on which the paper is taken off is a rough, wooden spindle affair, regulated in its action by iron weights on the end of a rope. A stop-gauge guillotine cutter takes it from the roll, and the operator, at his leisure, cuts it to size, sheet by sheet. If it is required to cut the paper to a smaller size, it is folded and torn apart over a scythe-blade attached to the wall. The mill is said to have a maximum capacity of two thousand pounds for twenty-four hours, but, as it is operated throughout by one man, the output is probably considerably less than half a ton a day."[155]

The mill was operated by several paper-makers during the first thirty years of its existence and then, in 1856, became the property of F. D. Knowlton, who managed it, alone and with his son, until the time of his death, before 1900. The son, also F. D. Knowlton, followed his father as sole proprietor of the mill which still remained a one-man establishment, the second Knowlton, as its Pooh-Bah manager, being his own superintendent, engineer, machine tender, cutter, shipper and business manager. His product, which was mostly manilla wrapping, went principally to local storekeepers in Dansville and neighboring villages. This long-enduring mill was burned July 18, 1913, and was not rebuilt.

Gurdon Caswell, a man from Connecticut, in which state he was born in 1783, emigrated to Oneida county, N. Y., in 1804, and settled in Westmoreland. He was a tailor by trade, but, marrying a daughter of Nathaniel

[155]E. J. Hathaway: *Primitive Paper-making in New York State.* In *The Inland Printer* (1909), XIII., p. 712.

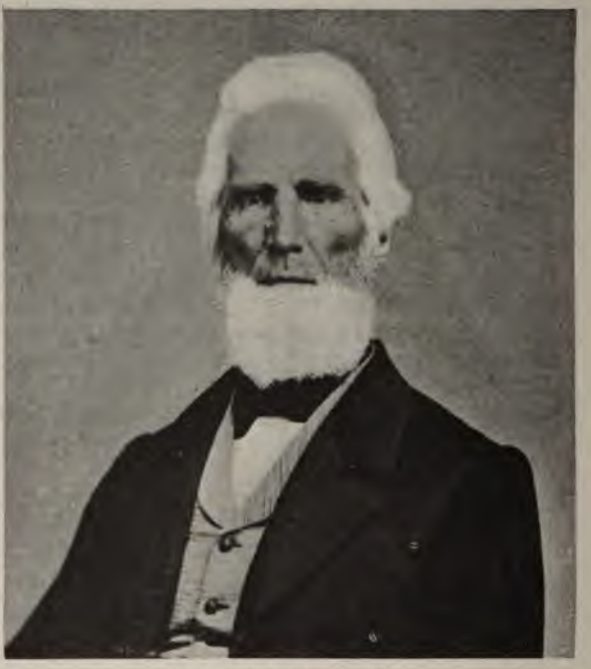
Loomis, who owned a paper-mill situated on Oriskany creek, a few miles from Utica, he also married into the paper-making industry. Four years later he was attracted to the Black river country, in the general movement of population which was then setting in in that direction, and, going to Watertown, built there a paper-mill, the first in that region. George W. Knowlton, of the family of paper-manufacturers of that name, wrote a considerable account of this mill. He said:

> "The building was a two-story frame structure thirty-five by fifty feet, but a considerable part of the second floor was used for a wool-carding machine. The machinery consisted of a small rag engine or Hollander, carrying about one hundred and fifty pounds of rags; two or three potash kettles set in a brick arch, for boiling the rags and preparing the sizing; one vat for making the paper, sheet by sheet; and a rude standing press to squeeze the water out of the pack, as the pile of alternate felts and wet sheets was called. After pressing, the sheets were taken from the pack and hung on poles to dry, and, if intended for writing purposes, were afterwards dipped in sizing, a few sheets at a time, and dried again. There was no steam used in any part of this process; no chlorine for bleaching; no calendering, the substitute for the latter being pressing between boards."

Caswell called his mill the Pioneer. Caswell's family remained in Oneida county until 1814, when he bought a farm and moved them to Watertown. In 1819 he built his second mill, which was soon sold to his brother, Henry Caswell, and brother-in-law, Erastus Loomis, and was operated by them and others until it was burned in 1833. In 1823 Caswell, in company with Ralph Clapp and William K. Asherd, built a third mill on Sewall's island, occupying part of the premises owned, three-quarters of a century later, by the Bagley & Sewall Company. This mill was torn down about 1830. Caswell removed to Clayton, Jefferson county, in 1832, and died there in 1862, aged seventy-eight years.

In 1824 George W. Knowlton and Clark Rice, then living in Brattleboro, Vt., bought the first two mills built by Caswell, for $7,000. For the next thirty years Knowl-

ton & Rice were, with unimportant exceptions, the only paper-manufacturers in Jefferson county. In 1833 they abandoned both the old mills and built on another site a new mill, which they equipped with two rag engines and a thirty-six-inch cylinder machine. The career of this establishment has been continuous to contemporaneous times. It was conducted successfully until 1848, when the building was burned, being replaced by a brick structure, with improved machinery and a capacity of from six



GEORGE W. KNOWLTON.
Pioneer Paper-Manufacturer in Watertown, N. Y.

hundred to seven hundred pounds of paper per day, which remained in continuous service until it was rebuilt, enlarged and modernized in 1869 by Knowlton Brothers.[156]

Paper-making began in the Niagara Falls region in

[156] J. A. Haddock: *History of Jefferson County, New York,* (1895), p. 203. S. W. Durant and H. B. Pierce: *History of Jefferson County, New York,* (1878), p. 150. *The Paper Trade Journal,* October 16, 1897, p. 45.

1823, when Jesse Symonds, a Connecticut man, experienced in the paper-trade world, arrived and began the erection of a mill. The water for power was taken from the river, the right having been purchased from Judge Augustus Porter and General Peter B. Porter. Mr. Symonds died before the mill was completed, but his wife continued the work and leased the mill to Henry W. Clark, of Rochester, who made print, letter and wrapping paper, and found his customers in the surrounding towns and country, his men driving from place to place buying rags and selling paper.

When Clark's lease of the mill expired he entered into partnership with Albert H. Porter, the second son of Judge Porter, and together they purchased a mill site on Bath Island, with water privileges. For a number of years they operated the mill successfully by the old hand methods, but eventually a Fourdrinier machine was introduced, set up and run by Charles H. Symonds, the son of the pioneer mill builder. The site on Bath Island was chosen in order to obtain clear water for the linen, ledger, news and writing paper, while wrapping paper was made during the periods of muddy water. In 1840 Clark sold his interest to his partner, Porter, who, at this time, was making paper for the old *Buffalo Express* and the *New York Tribune.* Porter, in turn, sold to the Bradley brothers; after a few years L. C. Woodruff, of Buffalo, became the owner, and he also rebuilt the mill when, in the course of time, it was destroyed by fire.

Webster, Ensign & Seymour continued to operate the mill near Troy that they had bought before the beginning of the century. The mill was worked largely in the interests of Webster, who owned the *Albany Gazette,* the first newspaper started in that city. In the regulation advertisement for rags the *Gazette* stated that the mill was making five to ten reams of paper every day, Sundays excepted, a very considerable part of which was used by the newspaper. It was urged that if the neighborhood could supply the rags needed this would mean a saving of at least £5,000 annually to the city of Albany. Offers were made of three pence a pound for clean white rags, two

pence a pound for white-blue, brown and check and proportionate prices for others.[157]

General Walter Martin came into the Black river country in 1800 and settled in that part of the town of Turin which afterwards was Martinsburgh, obviously named for its founder and proprietor. In 1807 he built there a paper-mill which was put in operation by John Clark & Co. The mill had a pulp engine and was intermittently worked for twenty-five years. In its early existence it produced writing paper, but later its product was wrapping and wall-paper.

In 1802 Ezra Sampson, George Chittenden and Harry Croswell started a newspaper, *The Balance and Columbian Repository,* in Hudson, and to supply their press Chittenden purchased a one-vat paper-mill that had just been transformed by Elisha Pitkin from a grist-mill situated at Stuyvesant Falls. This was the first paper-mill in Columbia county. A few years later Chittenden built another mill, the second in the county, on the same stream, Kinderhook creek, in Stockport, near Hudson. He operated that mill from 1810 until his death in 1845, his sons ultimately being associated with him in the business and continuing it after he had died.[158]

The smaller mills in New York State at this time varied in value from $10,000 to $40,000 or more. The Onderdonk mill, which was built in Hempstead, L. I., in 1768, the first in the colony, was sold in 1801 to Daniel Hoagland and Abraham Coles for $12,500. The Beach mill in Saugerties, where the first Fourdrinier machine in the United States was set up in 1827, was worth about $30,000. Other mills in this class, besides those already mentioned and many that must be passed by, were the Benjamin, at Catskill; the Wood & Redington, near Schoharie; the Simonds, Case & Co., at Farmington, and the Peck, at Rochester.

The Gilpin brothers, who, in the latter part of the pre-

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[157]A. J. Weise: *The City of Troy and Its Vicinity,* (1886), p. 229.

[158]*Columbia County at the End of the Century,* (1900), pp. 641 and 655. F. Ellis: *History of Columbia County, New York,* (1878), p. 137.

ceding century, had come into the front ranks of American paper manufacturers, maintained their position until long after 1800. Their paper became known all over the country. The invention of the cylinder machine by Thomas Gilpin, and other improvements that they were able to make, gave them additional prestige. But their prosperity did not endure.

Not only were they unfortunate in losing the advantages that they expected to derive from their revolving cylinder process, but worse disasters befell them. In the great flood of February, 1822, when the Brandywine rose twenty feet above its banks, their dam was carried away, their races destroyed, some of their machinery injured and several buildings damaged. In April, 1825, a fire destroyed several buildings of the plant and much valuable machinery. A climax came in 1838 when another flood damaged the property again and more seriously than before. Thereupon the owners, after fifty years of business, decided to discontinue. The estate was sold and the buildings were refitted for the manufacture of cotton goods.[159]

A contemporaneous writer gave a description of this mill and its surroundings when it was in its prime.

> "Citizens and strangers often resorted to this estate for a pleasant walk and to enjoy its beauteous scenery, as well as to see the novelty and skill of mechanism, visit the wonder-working machine that could turn out an endless sheet of paper. Paper-making is too well known to need a description. Yet, as things here were on the most approved plan, and order and neatness presided, we will venture to sketch one apartment in the old mill—a large *salle* on the lower floor, where more than thirty women were seated on high stools at a long table placed before the windows, each one having a knife to pick the motes from every sheet; and they were dressed becoming their occupation, with a clean apron as smooth as if an iron had just been rubbed over it. Not a cobweb marred these white walls, nor was dust allowed to soil the floors.

[159] J. Thomas Scharf: *History of Delaware* (1888), II., p. 653.

"Just above this, a large and modern stone building was occupied in the same way. Many departments of the business were carried on in each of these houses. The stone house below was used for assort-

THE GILPIN MILL ON THE BRANDYWINE.
Here Was Produced the First Machine-Made Paper in the United States.
From a wood engraving by John Sartain.

ing and cutting rags, and another stone structure for extracting colors. In this, immense kettles were fixed in furnaces built of stone that seemed immovable.

"Flat boats often conveyed paper on the water from

one mill to another; but it was generally taken in wagons to the Wilmington wharves. Large quantities of bank note paper were made here. We have seen whole pieces of new silk handkerchiefs cut to mix with the rags, to designate its manufacture."[160]

Several attempts were made to start paper-manufacturing in Pittsburg and vicinity, but the enterprise did not long endure, for the rolling-mills, iron foundries and other sooty establishments put white paper quite out of the question. Local historical authorities have contributed information, interesting—brief though it is—concerning these early efforts.

"We have two extensive paper mills, one on the Big Redstone, and the other near the mouth of Little Beaver creek, which manufacture good paper of different kinds to the value of about 25 or $30,000 worth annually. But they do not supply as much as the market stands in need of; much of this article is yet hauled over the mountains. (There are six paper mills, we are informed, in the state of Kentucky, one of which goes part of the year by the force of steam)— ☞ We sincerely admonish our good housewives and their little daughters to save all *clean linen and cotton RAGS,* for without these no paper can be made, and without paper, books cannot be printed."[161]

"In 1813 the making of paper west of the mountains had made rapid progress from 1795, the year in which Jackson & Sharpless got their paper-mill on the Redstone in operation, and the first in the country. At that time it was doubted whether rags could be got in sufficient quantities to keep the mill going. The saving of rags has kept pace with the erection of mills, for notwithstanding the consumption of seven, all are well supplied, and there appears to be a prospect of getting plenty for two others now erecting. This increase in domestic economy in so short a period is perhaps unexampled. In 1795 there was about ten or twelve thousand dollars' worth of paper made annually, until 1808, when [John] Coulter, [John] Beaver and [Jacob] Bowman erected a mill on Little Beaver;

[160] Elizabeth Montgomery: *Reminiscences of Wilmington,* p. 40.
[161] *Cramer's Pittsburgh Magazine* (1810).

> this also made paper to an equal amount with the first. At this time, [1812,] paper to the amount of about $80,000 annually, is manufactured in the western part of Pennsylvania and in the state of Ohio, besides what is made in Kentucky, which is also considerable. The paper mills erected lately are as follows:—Messrs. D. & J. Rogers, on the Youghiogheny, three miles above Connellsville; Messrs. Markle & Drum, on the Sewickly, Westmoreland, Pa."[162]

The Rogers mill, built in 1810, was owned by Daniel and Joseph Rogers and Zadoc Walker, and was the earliest manufacturing establishment in the township of Connellsville, Franklin county. The original owners were succeeded by D. S. Knox, M. Lore and John Scott, who continued the manufacture of paper until 1836, when the business was discontinued. The paper from this mill was considered to be of superior quality, and a large business was built up by the Rogers brothers and their successors. Paper was shipped down the Youghiogheny river on flat boats to various points, even as far south as New Orleans. Years ago only an old stone house and a mass of ruins remained to indicate the location of a once prosperous manufactory and the village that surrounded it.

In 1816 another mill was started in Pittsburg with a sixteen horse-power engine on the Oliver Evans principle, claimed to have been the first steam paper-mill in the United States. Forty helpers were employed, and annually ten thousand bushels of coal were consumed, sixty tons of rags made into pulp, and paper to the value of $30,000 produced.[163] This mill was in existence a year later, included in a list of the factories in the city, published by the city council. Also it, or its successor, appears in Lyford's *Western Address Directory* in 1836, but after that it is not of record.

By 1825 the number of mills in western Pennsylvania had grown to be nine—four of them owned in Pittsburg. Six, run by water power, contained two vats each and in

[162] J. Trainor King: *Pittsburgh, Past and Present* (1868), p. 71.
[163] J. L. Bishop: *History of American Manufactures*, II., p. 231.

one were three vats. Three others were worked by steam, one having three vats and a twenty horse-power engine, and the others four and six vats, respectively, with engines of thirty horse-power. In all the mills rags to the value of $68,000 were annually consumed, and the annual product was valued at $150,000.[164]

In the closing years of the eighteenth century the western country as far as Kentucky depended almost entirely upon paper made in a lone mill in Chambersburg, which was built soon after 1780 by Dr. John Calhoun, a son-in-law of Colonel Benjamin Chambers, who founded the city that bears his name. Until it was removed, in 1832, this mill had a large product for its day, and supplied many newspapers in that part of the country west of the Susquehanna river. For many years, in its early existence, the *Pittsburg Gazette* was printed on paper made in this mill, the weekly supply being transported from mill to newspaper on pack-horses over rough country roads.[165]

Another mill in Chambersburg, Penn., as early as 1788 was built by John Scott, and for a decade or more after that the newspapers of Pittsburg and elsewhere west of the Allegheny mountains continued to be supplied from this point.[166] In 1790 the first really important mill in Chambersburg was built by John Shryock. This was the Hollywell, and until well into the next century it was one of the noted mills of the country. Printing paper and various kinds of wrapping were made there at first, and then bank note paper of a superior quality, the United States Government becoming a large customer. In current fiction of the time are stories of how "Lewis the Robber," a notorious local outlaw who was then terrorizing the community, made frequent attempts to enter this mill at night to secure a supply of government paper for counterfeiting purposes. In the hands of George A. Shryock, who followed his father about 1827, this mill became identified

[164] J. L. Bishop: *History of American Manufactures*, II., p. 301.

[165] *History of Franklin County, Pennsylvania*, Warner Beers & Co. (1887), p. 473.

[166] I. H. McCauley: *Historical Sketches of Franklin County, Pennsylvania* (1878), p. 55.

JOHN SHRYOCK.

with the first experiments in making paper from straw, and to the history of that branch of the industry much of its subsequent record belongs. In a few years, under other ownership, it returned to its former employment of producing various kinds of paper from rags, being fitted with more modern machinery and many other improvements.[167]

A citizens' committee of the leading manufacturers situated in Delaware county, Penn., was appointed in 1826 "to ascertain the number, extent and capacity of the manufactories, mills and unimproved mill-seats in the county." The committee, as one of the results of its investigations, reported that there were eleven paper-mills, annually manufacturing thirty-one thousand two hundred and ninety-six reams of paper valued at $114,712, and employing two hundred and fifteen persons, whose wages annually were $29,120. Mentioned first among these establishments were the Ivy Mills and the Glen Mills, then operated by Mark Willcox and his son, John Willcox, who employed eighteen persons and produced annually one thousand five hundred reams of fine paper; and a two-vat mill on Chester creek, owned by William Martin and Joseph W. Smith, and operated by John B. Duckett, who, with twenty-three helpers, produced week by week sixty reams of quarto post and thirty-three reams of medium printing.[168]

In 1817 Thomas Amies, a noted paper-maker of Philadelphia, produced a quantity of paper for a special printing of the *Declaration of Independence,* which was designed to surpass everything that had been attempted in America up to that time. The mould and felts were made expressly for the purpose, the size of the sheet was twenty-six by thirty-six inches and only the finest linen

[167] *History of Franklin County, Pennsylvania* (1887), p. 474.

[168] John Hill Martin: *Chester and Its Vicinity,* (1877), pp. 230-234.

rags were used. Each ream weighed one hundred and forty pounds and the price was one hundred and twenty-five dollars. Amies was at one time superintendent of the Willcox Ivy Mills at Chester, but when he made this paper he owned and operated the Dove Paper Mills, Lower Merion, Montgomery county. He had drawn upon the Willcox establishment for the name of his mill and for his paper he also appropriated the Willcox dove water-mark.

Another Chester county mill that had a long and substantial existence was that of the Mode family in Modena. The building was erected in 1810 by William Mode, whose sons, Alexander and William, began to make paper there in 1812, producing daily about two hundred and fifty pounds. In 1840 the business was discontinued, but ten years later William and Alexander Mode, sons of the second William Mode, remodeled the building, put in modern machinery and continued the business until toward the end of the century. They increased the product of the mill to two thousand five hundred pounds and it is said that on "one occasion they had paper made, dried and cut into sheets in three hours after the rags were sorted," which was boasted of as a very remarkable performance.[169]

Samuel Jackson and Jonathan Sharpless operated their mill on the Redstone creek in Fayette county, until 1810. After that it was run by members of the Jackson and Sharpless families in successive generations until, in October, 1842, it was burned with a large stock of paper, all valued at $20,000; and that disaster brought the business to an end after fifty successful years.[170]

In Beaver Valley, New Castle county, Delaware, about seven miles from Wilmington, but more nearly in Pennsylvania the Sunny Dale mill had its beginning in the early part of this century and it lasted for more than a hundred years. A woolen-mill was built there, in 1811, by John Ferra, but that was soon burned and was rebuilt

[169] J. Smith Futhey and Gilbert Cope: *History of Chester County, Pennsylvania* (1881), p. 175.

[170] F. Ellis: *History of Fayette County, Pennsylvania,* (1882), p. 622.

SUNNYDALE PAPER MILL—EXTERIOR.

as a paper-mill. When John Ferra died he was succeeded by his son, Daniel Ferra, who kept the mill until his death in 1860, having once rebuilt it after it was burned in 1850. Francis Tempest then became the owner and operated it for more than fifty years. In its early days of hand-work, writing and book papers were made, but later, tissue was the product, the machine equipment being a thirty-six inch cylinder and two one hundred and forty pound engines. The power was water and steam and the capacity one thousand pounds per week. It was a one-man as well as a one-machine mill. Tempest did all the work, buying the materials, running the engine, making the paper and selling his goods.[171] Thus it existed until 1901 when it came into the possession of Edwin Garrett. The new owner enlarged and improved it, making it more modern and increasing its output.

In Drake's *Cincinnati,* published in 1815, there is mention of "new and valuable paper-mills erected on the Little Miami river." The mills referred to are believed to have been that of Kugler at Milford, and that of Howells at Lockport about two miles above Milford. Both made wrapping and writing paper, the daily product not exceeding one hundred to one hundred and fifty pounds. Kugler's mill was built between 1800 and 1810 by a settler named Wallsmith who bought the waterpower at Milford and erected a saw-mill, flour-mill, carding-mill, distillery, and paper-mill. Mathias Kugler, who was employed in the paper-mill, eventually became the owner.

The mill at Lockport, converted from a flour-mill, was started by Frank Howells shortly after Wallsmith had erected the mill at Milford; it produced wrapping, news, print and writing papers, but the amount was small and the prices big. A few miles farther up the Little Miami Joseph Duval, about 1815, built a mill which was in operation several years. Duval was of French extraction and had come from Philadelphia. He was socially prominent in Lebanon, near which place he built his mill, and was famous for entertaining.

[171] *The Paper Trade Journal,* October 16, 1897, p. 11.

SUNNYDALE PAPER MILL—INTERIOR.

Before 1830 two mills were built in Cincinnati, one by Thomas Graham, who has been credited with inventing and constructing the first paper-machine in the West to be worked by power. The night before the mill was ready to start, in December, 1826, it was destroyed by an incendiary fire. The owners immediately rebuilt it, called it the Phoenix and had it ready for operation in June, 1827. The building was one hundred and thirty-two feet by thirty-six feet and was equipped with steam engines. About half a mile down on the bank of the Ohio the Cincinnati Steam Paper Mill, owned by Messrs. Phillips & Spear, was located. This was also worked by steam and employed about forty hands, producing a "large quantity of excellent paper" of an estimated value annually of $22,000.[172] These mills comprised all the paper-manufacturing in Ohio prior to 1825 or 1830.

Several mills were in Tennessee in the early part of this century, although since the civil war that has not been a paper-manufacturing state. Precisely when or where the beginning was made is not certain, but it is believed that mills were operated in or before 1810. About that time the general assembly of the state determined to encourage the manufacture of paper and two statutes were enacted, the first, which was passed on November 13, 1809, being as follows:

> "Whereas, it is considered by the present legislature that an increase in the home manufacture will promote the independence of our rising state: Therefore, be it enacted by the General Assembly of the State of Tennessee that, from and after the passage of this act, all persons immediately in the employment of the manufacture of paper in any of the paper-mills erected in this State, or that may be employed in any mill that may hereafter be erected, that they be and are hereby exempt from working on roads or highways or from attending musters in the companies, regiments or battalions to which they belong, provided that in all calls for militia they shall be subject in the same manner as they would have been had this act never been passed."

[172] B. Drake and D. Mansfield: *Cincinnati in 1826.*

The second statute, which went into effect on November 23, 1811, read as follows:

> "To encourage the manufacture of paper: Be it enacted, That all persons who are owners of paper, or shall hereafter be, shall be allowed to employ some person to peddle and merchandise rags without paying tax, provided nothing herein contained shall authorize those persons to take or receive any money or articles for said goods but rags."

W. S. Whiteman, of Knoxville, was one of the pioneers in Tennessee and in the South. Reared near Philadelphia, he learned the business of paper-making in the mills in or adjoining that city, and went to Tennessee probably as early as 1806. It was not, however, until years later, some time previous to 1837, as nearly as can be ascertained, that he built a mill on Middle Brook creek, about four miles from Knoxville, and successfully operated it for a few years prior to his death in 1840. The machinery for this mill, exceedingly primitive, though fully up to that date, was hauled in wagons from Philadelphia, the only means of transportation from Philadelphia to Knoxville then existing.

A son of Whiteman, W. S. Whiteman, Jr., grew up with a thorough knowledge of the business of making paper and, going to Nashville, became associated with John A. McEwen, O. B. Hayes and John M. Hill, who had already built a mill there about 1835 or soon after. Operation of this mill, which was on the bank of the Cumberland river, continued for eleven or twelve years under this joint ownership, and then by Whiteman alone. Afterwards interested with the Whiteman enterprise was W. O. Harris, the chief owner and manager of *The Nashville Banner*, who assisted in building up the business of another mill on White's creek, about eight miles from Nashville, to which the machinery of the Nashville mill was removed. A pulp mill was also built on Paradise Ridge.

The first Nashville mill ultimately passed into the hands of the Rock City Paper Manufacturing Company. On Duck river, about a mile from the town of Manchester, Whiteman Brothers operated a paper-mill for several

years, and in 1837, on the Cumberland river, about a mile above Gallatin Landing, Morris & Rogers built a mill.[173]

In 1840 there were six mills in the state, the Grainger, Knox, McMinn, Sullivan, Davidson and Sumner. Together they had a capital of $103,000, and produced annually paper to the value of $60,000. In 1860 there were but two mills left, with a capital of $28,000 and an annual product, valued at $14,500.[174]

In Kentucky, between 1800 and 1805, Isaac Yarnall built two single-vat mills about six miles west of Lexington and a one-vat mill was also started in Logan county. During the first decade of the century there was also a mill at Great Crossing, on the Elkhorn river, but whether that was Craig's mill, that was built in 1792, is not known.

An emigrant's directory, issued from Auburn, N. Y., in 1817, mentioned that in the state of Kentucky there were several paper-mills and that in Lexington there were two mills operated by steam. The first mill in Louisville was built in 1814 by the firm of Jacob & Hicks, and most of its product was sold to the *Western Courier*.

In 1820-21 Amos Kendall, who afterwards became postmaster-general in the cabinet of Andrew Jackson, built the Franklin mill on the main Elkhorn, a mile and a half below what is known as the Forks of Elkhorn, a Kentucky village of considerable size. A year previous there had been talk of the federal government establishing an armory in that locality, and Kendall, acting on inside advance knowledge of the plan, had purchased the land on speculation so as to sell it to the government. He began the erection of his mill in the summer of 1820, and it was completed early in 1821. Later the property was purchased by E. H. Steadman and was operated by him and others with only indifferent financial results. In 1875 it was purchased by Dupont & Co., who removed the machinery to another mill which they owned in Louisville.

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[173] *R. A. Halley: Paper-making in Tennessee.* In *The American Historical Magazine,* IX. (1904), pp. 213-216.

[174] Goodspeed: *History of Tennessee* (1886), p. 275.

CHAPTER NINE

THE INTRODUCTION OF MACHINERY

HOLLANDER ENGINES FOR PULP-BEATING—INVENTION OF THE FOURDRINIER AND ITS IMPORTATION INTO THE UNITED STATES—AMERICANS INVENT AND IMPROVE CYLINDER MACHINES—OTHER INVENTORS AND INVENTIONS—RADICAL CHANGES IN MANUFACTURING METHODS ARE GRADUALLY INTRODUCED

UNTIL well into the nineteenth century the original hand processes in paper-making had not been much improved upon. Only a very few small mechanical devices had, from time to time, been introduced into the mills, mildly to increase their efficiency. But the vat-men continued to dip the pulp into the moulds and shake out the water until the sheet was formed, and the sheets continued to be hung separately on rods in the lofts to dry The mill of 1800, save in the substitution of the beating engine for the fermentation or the stamping methods of reducing rags to pulp, was not materially different from that of 1700. More than one hundred years had elapsed since the first mill had been built in Pennsylvania but the American industry was still in an infantile state, as far as any appreciable attempt had been made to introduce machinery or new methods.

In the beginning of paper-making from pulp the rags were reduced by washing them in water and then setting the mass to ferment for many days in close vessels until the desired pasty state of comminution had been attained. An advance upon this crude method came in the introduction of stamping rods to beat the rags into pulp. These

rods, incased with iron at one end, were operated in oaken mortars. To some extent, at first, they were worked by hand but most generally they were moved by water-wheel machinery. Even this method of getting pulp was tedious and unsatisfactory enough. Sometimes forty pairs of stamps would be required to work steadily twenty-four hours in order to prepare a hundred pounds of rags.

Then came the beating engine or Hollander, so called from the supposed country of its origin. Most authorities on this subject have placed this machine first about the middle of the eighteenth century. Some even have given 1750 as the precise year of its appearance and that date has been generally accepted. Doubts exist concerning this, however, and it must be conceded that good reasons have been adduced to show that the machine or, at least, something analogous to it, was in use a half century or more before that time. The case has been concisely stated by an English writer:

> "Unfortunately the date of the invention of this important machine has not been definitely traced. The earliest mention of it seems to occur in Sturm's *'Vollständige Mühlen Baukunst,'* published in 1718. It was in extensive use in Saardam in 1697, so that the invention is at least some years previous to 1690." [176]

But by whomsoever invented or wheresoever first used, the machine, as it was finally developed in Holland, was for a process of macerating rags into pulp for paper-making by means of a revolving cylinder armed with metal blades which rotated in close proximity to a stationary plate composed of similar blades. Between these blades the stock was drawn by the motion of the roll and subjected to continuous beating until it was reduced to pulp consistency. The Hollander has been in uninterrupted use to the present day although the modern machine represents a great advance over its prototype. During the hundred and fifty or more years that have elapsed since it was devised it has been greatly changed, enlarged and im-

[176] R. W. Sindall: *The Manufacture of Paper,* (1908), p. 16.

proved; and others, patterned after it, have arisen. But the fundamental principle of the original still remains in the modern beating engines which are essential instruments in all paper-making.

In Holland the first engines were small and were driven by wind-mills, the principal source of power in that country. The new machine was slow in being accepted elsewhere, but it soon superseded the old process in Holland. It is said that, in 1770, there were eleven large mills in Holland where the engines driven by wind-mills accomplished more in an hour than the mills in Germany, where water-power was used with stampers, could perform in six hours. In the United States the Hollanders were run by water-power at first and long afterward by steam-power. Their introduction made the first decided change in methods that the mills had known, increasing their power of production and improving the quality of the paper that was made, and enabling the industry to go on to a wider development than it had before known. Supplementing the beating engine came the Jordan, an American invention, which takes the pulpy mass from the stuff-chest and further cleanses and refines it and makes it of uniform consistency before it is finally delivered to the paper-machine.

In the early years of the century a few men of a mechanical turn of mind in Europe and in the United States were giving more thought to the possibility of devising some method of making paper by machinery. In other industries machinery had been introduced with promising results, and the advantages that should accrue from its adoption in paper-manufacturing could be safely predicted. For half a century the Hollander had been gradually coming into extended use and with this, pulp could now be produced in larger quantity than it could be utilized in ordinarily equipped mills, with the vat-men working only by hand. A faster method of transforming the pulp into paper was an economic necessity. Machines were needed to supplement the Hollander and naturally they came, the Fourdrinier first.

The Fourdrinier was invented by Nicolas Louis Robert

who, while managing a large paper-mill in Essones, owned by St. Leger Didot of the famous French family of publishers, conceived the idea of making paper in a continuous sheet. After several years experimenting he produced a machine which consisted of an endless wire band passing between two squeezing rolls, and this was the primitive beginning of what was developed into one of the most marvellous of modern machines.

Robert obtained a patent in 1799. He had been assisted by his employer, Didot, to whom the patent for the new machine was now transferred. John Gamble, a brother-in-law of Didot, became interested and, going to England, took out patents there. Didot and Gamble entered into arrangements with Henry and Sealey Fourdrinier, wholesale stationers, who financed the invention in England. With them Bryan Donkin, a practical mechanic and machinist, was associated and he made improvements on the original, a new machine being patented in 1807 by the Fourdriniers and John Gamble and first made in 1808. In principle it was the Robert machine, but already it was far in advance of that.

The Fourdrinier brothers spent over £60,000 experimenting and improving the machine and in consequence thereof were forced into bankruptcy. With them Robert, Didot and Gamble were ruined. In 1840 a grant of £7,000 was made to the Fourdriniers and that, with the distinction of having the machine forever known by their name, was all that ever came to them for their labors and expenditures. Robert had previously received from the French government a bounty of eight thousand francs and that was the sum total of his profits from his ingenuity. Bryan Donkin was the only one of the group who profited financially. Devoting himself to the manufacture of the machine he did well and eventually was successful in establishing a large business out of it.

In point of date the Fourdrinier, in France and in England, was the first really great invention that paper-manufacturing had known. So great indeed was it that, not only did it practically revolutionize paper-making the world over, in the course of time, but it became firmly fixed as

the one fundamental factor of the industry in its modern existence, elevating it into the front rank of mechanical pursuits.

Meantime, however, others had been working along somewhat similar lines toward the same end that Robert had reached. John Dickinson, of England, succeeded in 1809. He invented and patented a cylinder covered with a wire cloth, the cylinder to revolve in a vat filled with pulp which, by a system of suction, was made to adhere to the cloth until the paper sheet was formed, when it was passed on to another cylinder covered with felting. Whether the Dickinson invention was early known in the United States cannot be said; but the first American paper-making machine may have been suggested by it or may have been worked out independently.

Models in the patent office were destroyed when the building of the treasury department in Washington was burned in 1836, and specifications of very few of the patents issued prior to that date can now be found. A patent for a paper-mill was issued to Thomas Langstroth of Bucks county, Pennsylvania, in 1804, and a patent for a paper-making machine to Charles Kinsey of Essex, N. J., in 1807. It has been thought that possibly in these patents the Gilpin and the Ames machines of later date may have been anticipated. Positive evidence of this, however, is lacking, and it is altogether unlikely that if such machines were brought out they did not endure long enough to leave some record, even though slight, of their performances.

At any rate it was nearly twenty years after the invention of the Fourdrinier in France and seven years after the appearance of Dickinson's cylinder machine in England before the American machine can be said to have really appeared. At that time nothing was known here about the Fourdrinier or the cylinder in any practical way. Both had been slow in adoption even in England, and as for the United States, they had not been discovered —or, at least, only theoretically.

Description has already been given of the Gilpin mill, near Wilmington, Del., and an account of its pre-eminence for half a century, and brief reference has been made to

its peculiar distinction as being the home of the real beginning of the making of paper by machinery in the United States. Gilpin had been long experimenting before he solved the problem of a paper-making machine. In December, 1816, he was able to take out his patent and in August of the following year he put the machine into actual use in his mill, running off, for the first time, on this side of the Atlantic, machine-made paper, in place of the hand-made article. The invention showed increase of speed and power, as well as economy in cost of producing. The Gilpin machine was more simple and, as was ultimately demonstrated, less efficient than the Fourdrinier, but it demonstrated the wide possibility of a very great advance in the manufacturing of paper. It was merely a revolving cylinder making paper continuous and endless in length instead of in single sheets. In no respect was it an advance upon, even if it was equal to, the Dickinson of England. But its introduction into the mills of the United States anticipated all the foreign machines by a few years, at least, and gave the first decided impulse in this country to the making of paper by machinery.

When finally Gilpin felt confident of success he sent to Philadelphia a sample—writing paper of excellent quality—taken from a sheet one thousand feet long and twenty-seven inches wide and had it deposited with the American Philosophical Society. Shortly after, the mill began to furnish this machine-made paper to the market, first for Poulson's *American Daily Advertiser* of Philadelphia and for other newspapers, and then for book editions and for writing. In 1820 and 1821 this kind of paper was furnished to Matthew Carey & Son, the Philadelphia publishers, for the letter-press and colored copper-plate engravings for the printing of the first American editions of Lavoisne's famous *Complete Genealogical, Historical, Chronological and Geographical Atlas.* This was five or six years before any paper was made from a Fourdrinier in this country.

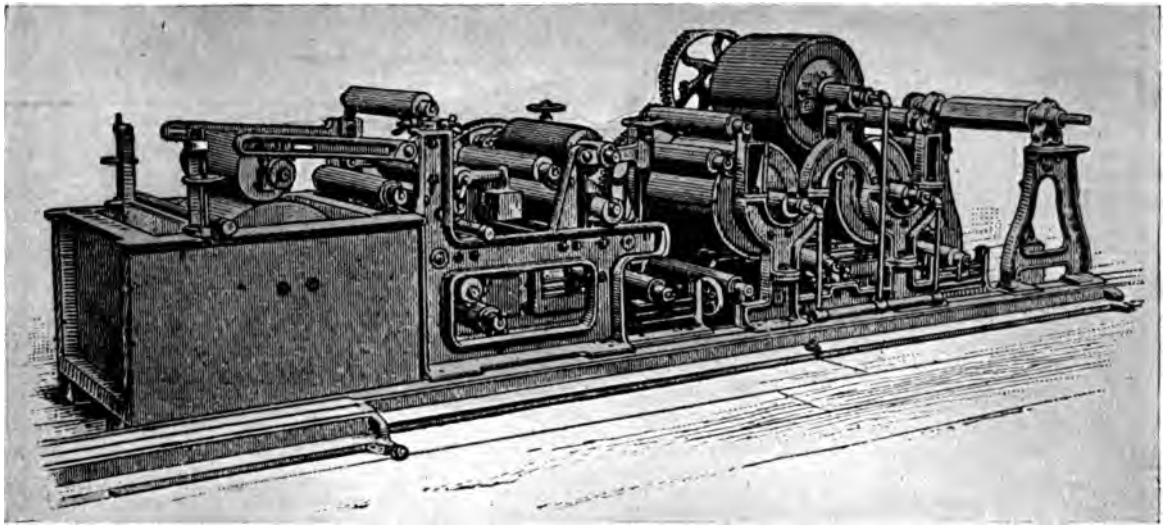
News of this invention speedily went out, for its tangible results began to have their natural effect upon the trade. A wide and substantial reputation accrued to the Gilpin

mills for the quantity and the quality of the new kind of paper that they were able to produce, and their prosperity increased proportionately. The Gilpins made every effort to keep their machine a secret, but it was impossible to hide it altogether and permanently. The more the success of the machine was demonstrated, the more were jealousy and envy excited among other manufacturers.

That it would seriously and permanently affect business throughout the country was perfectly obvious, and all means, fair and unfair, were taken to procure knowledge of it. Eventually, by obtaining scraps of information from some of the Gilpin workpeople and by careful study of the patent, sufficient ideas were obtained to render evasions of the patent possible. Experiments were made by other proprietors of mills and they were soon able to profit by the new idea. In this they were undoubtedly aided to some extent by increasing knowledge here of the character of the English cylinders. Within a few years the Gilpins found that they could not permanently retain the advantage over competitors that their cylinder had for a time given them. Several new and improved cylinders were brought out before 1830. Eventually the cylinders were generally introduced into mills everywhere and the prestige of the invention and the credit of having begun the making of paper by machinery in the United States have never been fully accorded to Thomas Gilpin.[177]

The story has been told, and has been generally accepted as true, that John Ames of Springfield, during a visit to New York, heard of the Gilpin machine and its wonderful work, and thereupon took means to find out about it and to appropriate the principle involved in it, with the result that he was soon able to make a better machine of the kind for his mills. Whether this is true or not cannot now be determined. About all that we surely know is that John Ames was a mechanical genius and a clever inventor. The Dickinson cylinder machine was patented, in England, in 1809, the Gilpin in 1816, and the Ames in 1822

[177] J. Thomas Scharf: *History of Delaware,* (1888), II., p. 653.



THE SMALLEST PAPER-MACHINE IN THE WORLD.
Reproduced from *The Paper Trade Journal*, October 16, 1897.

—May 22. Ames was thirteen years after Dickinson and six years after Gilpin. He may have been an original inventor following original research, or he may have been merely an imitator. After him came Isaac Burbank of Worcester, Mass., in 1824; Gardiner Burbank of Worcester, in 1826; Isaac Sanderson of Milton, Mass., in 1829.

But the new machine brought more trouble than profit to the Ameses in the beginning. If John Ames did really steal the idea from Gilpin, the avenging Nemesis promptly got after him. It was evident that the cylinder was too good a thing to be permitted to remain undisturbed in the possession of any single concern. The struggle for it began immediately and is a matter of court record. Howard & Lathrop, who had a mill in South Hadley, Mass., hired an Ames foreman and built and put into operation a cylinder. The Ameses instituted suit for infringement of patent and the fight was on.

A combination of manufacturers was formed to oppose the Ames claims. Both sides sent attorneys abroad to investigate, on the contention that such a machine had been in use before in England, in France and in Italy. When the case came to trial, the patentee agreed that he did not claim invention of "the felting, vats, rollers, presses, wire-cloth, or any separate parts of the machinery," but did claim, as his specific invention, "the construction and use of the peculiar kind of cylinder and the several parts thereof in combination for the purposes aforesaid," that is, to be used in the vat containing paper-pulp. Thomas Gilpin, in a deposition, was one of the witnesses against Ames. The jury in the case, which was "John Ames *vs.* Charles Howard and others," found for the plaintiff. A new trial was denied by Judge Joseph Story in the October term of the circuit court of the United States, 1833.[178]

Litigation did not end with this decision, however. Infringements continued and the Ameses were obliged to fight for years to protect themselves. Their legal expenses were a heavy burden to them and in the end they were unable to maintain a monopoly in the new process.

[178] Charles Sumner: *Reports of Cases Argued and Determined in the Circuit Court of the United States for the First Circuit*, I., p. 482.

Like all other great inventions the Fourdrinier had to pass slowly through the region of doubt and opposition before it was finally fully approved and accepted. In England, between 1803 and 1812, Donkin had made only ten machines and in the next ten years twenty-five more, a total of thirty-five in nineteen years. It was not until later that the machine succeeded in establishing itself in substantial favor. In forty-three years, after his beginning

JOHN AMES.

in 1803, Donkin had made all told one hundred and ninety-one machines. Prior to 1825, in the United States, the machine had been heard of, but that was all; none had been seen here.

It has never been conclusively determined where and when the first Fourdrinier was located on this side of the Atlantic. The best evidence, however, seems to indicate that the machine was imported in 1827 by Henry Barclay

of Saugerties, N. Y., was set up in the mill in Saugerties owned by Beach, Hommerken & Kearney and was there started running by Peter Adams who afterward founded the Peter Adams Company in Buckland, Conn., and the Adams & Bishop Company in Newburgh, N. Y. The machine was built by Donkin of London and was sixty inches in width. The senior member of this firm of paper-manufacturers was Moses Y. Beach, afterward owner and publisher of the *New York Sun.*

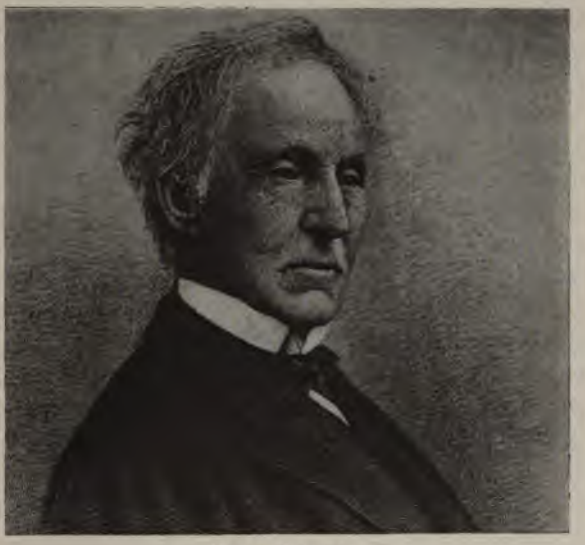
In later years this mill was owned by J. B. Sheffield & Son and parts of the original machine remained in use for forty-five years, being finally destroyed by fire in 1872. A second Fourdrinier, sixty-two inches wide, built by Joseph Newbold, near Bury, England, was placed in this mill in 1829. But prior to this, in December, 1827, the second Fourdrinier in the United States, sixty inches wide, was imported from England and set up in the Pickering Mill, in Windham, Conn. In March 1829 William Marshall from England brought over a machine to Boston in the ship *Dover.*[179]

The first Fourdrinier made in the United States was by the Smith & Winchester Manufacturing Company in their shops in South Windham, Conn., in 1829. It was set up in the mill of Amos H. Hubbard,—in later time The A. H. Hubbard Company—Norwich, Conn., in May of that year. The same company made another machine for Henry Hudson of East Hartford, Conn., and a third for the mill of W. & C. Baldwin, near Bloomfield, N. J. These three Fourdriniers were all that were made in this country before 1833.

Writing in 1850, James M. Wilcox of the Ivy Mills in Pennsylvania, referred to the advent of machinery, of which he had practical knowledge, and said that between 1820 and 1830 the first efforts were made to import machinery from Europe but the experiments failed of success for the reason that the machines [Fourdriniers] which were brought from England were sometimes imperfect and also cost too much. He spoke of the machines made

[179] *The Paper Trade Journal,* October 26, 1897, p. 69.

at reasonable prices in 1830 by Phelps & Spafford of Windham, Conn., and soon after by Howe & Goddard of Worcester, Mass., and added, "I believe these two establishments make all in the United States [1850]." Mr. Willcox expressed only qualified approval of the cylinder machines then in use saying: "The cylinder machine, more simple and less costly than the other, is in more general use; but the paper made on it is not equal in quality. Notwithstanding it does very well for news, and the various purposes which a coarse article will answer for." [180]



PETER ADAMS.

The first felts produced in the United States for paper machines were made in 1864. Prior to that time all endless felts had been imported from Europe, notwithstanding the fact that cylinder and Fourdrinier machines had been slowly increasing in number here for nearly fifty years. The manufacture was undertaken by Samuel T. Thomas, Albert Johnson, Andrew Fuller and Charles C. Newcomb, as the firm of Johnson, Fuller & Co. A mill in Camden,

[180] *Report of the Commissioner of Patents* [United States] *for the Year 1850*, (1851), p. 404.

Me., was leased and equipped with machinery and the experiment was successful from the outset. New machinery was invented, the mill was enlarged, new buildings were erected and the business expanded as the demands of the industry increased. In 1872 the firm changed into a stock company called the Knox Woolen Company and has so continued to the present day.

A woolen mill owned by Asa Shuler, in Hamilton, Ohio, made piece felts for paper-mills as early at 1854. In 1866, having learned from an English workman how endless felts were made abroad, Shuler entered upon that branch of manufacturing and ultimately, with John W. Benninghofen as a partner, the firm became pre-eminently successful in this line. Others who were in the business between 1870 and 1900 were: H. Waterbury and F. C. Huyck, Rensselaerville, N. Y.; The H. Waterbury Sons Company, Oriskany, N. Y.; H. C. Huyck and partners in Bethlehem and Rensselaer, N. Y.; The Acme Felt Company and The Albany Felt Company, Albany, N. Y.; The Akron Woolen and Felt Company, Akron, Ohio, which, in 1892, was succeeded by the F. Gray Company of Piqua, Ohio; The Lockport Felt Company, Newfane, N. Y.; The Megunticook Woolen Company, Camden, Me.; The Appleton Woolen Company, Appleton, Wis.; Green Brothers, Cazenovia, N. Y.; The Rumford Falls Woolen Company, Rumford Falls, Me.; L. Heathcote, Glen Rock, Pa.; Weiss & Son, Charleston, Ill.; there had also been mills in Lawrence, Mass., Louisburgh, Pa., Philadelphia and elsewhere, before the end of the century.

Five of these old establishments have continued to the present day: Shuler & Benninghofen, The Lockport Felt Company, The Appleton Woolen Mills, The Albany Felt Company and The Knox Woolen Company. In contemporaneous time The Fitchburg Duck Mills have come into this line of manufacturing.[181]

Fourdrinier wires continued to be imported from England for twenty years after the first Fourdrinier machine was set up in the United States. In 1847 William Staniar,

[181] *The Paper Trade Journal*, October 16, 1897, p. 84.

who had served his apprenticeship in one of the largest wire-cloth weaving establishments in Manchester, England, came to this country for the express purpose of starting the manufacture here. He was admitted to be a member of the firm of Stephens & Thomas, afterward William Stephens & Son, wire-weavers, in Belleville, N. J. He brought

WILLIAM STANIAR.

with him a model from which Cornelius Van Houten made the first American loom and on this, Staniar and Van Houten wove the first American wire, in September 1847. That wire was sixty-two inches wide by twenty-four feet ten inches long and was used in the mill of J. & R. Kingsland, North Belleville, afterward Franklin, N. J.

It was a difficult task introducing American wires. In

the paper-mills the machines were generally run by English and Scotch tenders who were constitutionally opposed to most things American. Also there were trade customs to be overcome and importers tried in every way to keep out the home-made wires. In the end, however, these wires succeeded, in spite of all opposition, and the time soon came when they were recognized as being superior to anything of the kind that was made in Europe.

A year after Staniar, another worker at wire-weaving, Robert Buchanan, came from Glasgow, Scotland. He located in Jersey City, N. J., but his plant was destroyed by fire before he was able to commence weaving. Thereupon he went to work for William Stephens & Son in Belleville and wove with John McMurray, another newly-arrived Scot.

Out of the Stephens establishment came, directly or indirectly, nearly all the big wire-weaving concerns of subsequent years. In the panic of 1851 William Stephens & Son failed. Staniar then started in business for himself, first in Belleville and then in East Newark, N. J., where the Staniar & Laffey Wire Company existed until into the next century. John McMurray left Stephens and, with the Cabble brothers, established another Fourdrinier business which in time became the William Cabble Excelsior Wire Manufacturing Company. The De Witt Wire Cloth Company succeeded the Stephens concern in Belleville and Cornelius Van Houten was one of its promoters.

Robert Buchanan left the De Witt company in 1876 and, with his sons, Andrew and James, removed to Boston where they started Morss & Whyte in the business. Subsequently they went to Holyoke and established The Holyoke Wire Works which eventually became The Buchanan & Bolt Wire Company. William Buchanan, another son of Robert Buchanan, served his apprenticeship in the shops of Stephens and De Witt and, in 1876, with Charles Smith, established the Standard Wire Works in Bloomfield, N. J. In 1877 John Eastwood was admitted to partnership in the Standard Wire Works, the concern being removed to Belleville, and its name changed to Eastwood, Buchanan & Smith and then to The Eastwood Wire Manufacturing

Company. In 1882 William Buchanan removed to Springfield, Mass., and there was foreman of the Fourdrinier department of the Cheney Bigelow Wire Works. In 1896 he went to Appleton, Wis., and, with two sons and a brother-in-law, established the Appleton Wire Works.

Fifty years after the beginning there were fifteen or more manufacturers running about two hundred broad looms on Fourdrinier wires, cylinder covers, dandy covers

CORNELIUS VAN HOUTEN.

and washer wires. The home mills were almost entirely supplied from these sources, only a few wires, of special character, being imported from Great Britain and France. The names of the manufacturers and the locations of their plants were:

Massachusetts—The Cheney Bigelow Wire Works, Springfield; Buchanan & Bolt Wire Company and Brown

& Sellers, Holyoke; The Thistle Wire Company, Lee. Connecticut—H. & T. McCluskey & Sons. New York—The William Cabble Excelsior Wire Manufacturing Company, Brooklyn. New Jersey—The De Witt Wire Cloth Company and The Eastwood Wire Manufacturing Company, Belleville; Alfred Workman, Kearney; The Staniar & Laffey Wire Company and The Lewis Wire Works, East Newark; Thomas E. Gleeson, Harrison. Ohio—The Reed Wire Works, Newark; The Tyler Wire Works, Cleveland. Wisconsin—The Appleton Wire Works, Appleton.

In 1916, of these early manufacturers, there were still left in the business the Buchanan & Bolt Wire Company, The Cheney Bigelow Wire Works, The Eastwood Wire Manufacturing Company and Thomas E. Gleeson, Inc.; with them were The Lindsay Wire Weaving Company, Cleveland, O.; The Joseph O'Neil Wire Works, Southport, Conn., and The Standard Wire Company, Harrison, N. J.

The first American dandy roll was made in the Stephens shop, Belleville, N. J., in 1847, by Cornelius Van Houten. William Staniar lettered this and he has told how "four impressions of a sheet 22x24 were taken off and forty-two impressions put in the same place, there being 1,092 letters, some of which (Romans) were not more than one-eighth of an inch in size." [182]

Before 1800 four patents relating to the manufacture of paper were taken out in the United States.[183] In the thirty-eight years ending January 1839, patents to the number of eighty-eight were issued by the patent office for machines and processes for the making and using of paper. These figures for four decades do not indicate any remarkable inclination on the part of the makers of paper in that period rapidly to improve upon the methods of working in the industry even after conditions had been materially altered by the new machinery. Aside from the few really big and important additions to the assortment of mill appliances little was brought forward or even attempted.

However, among these few early patentees were several

[182] *The Paper Trade Journal*, October 16, 1897, pp. 17 and 67.
[183] See p. 99, *ante*.

who made more than an ordinary impress upon the industry and whose achievements call, at least, for a cursory reference. John Ames, of Springfield, Mass., was easily first in respect to the number and value of his inventions. Notwithstanding failure fully to profit from his cylinder machine he continued to devise other labor-saving appliances, altogether for use in his mills. He patented few of his inventions but depended upon keeping their existence secret; in this he was only partially successful but managed for a time to derive the greatest advantage from them. Besides the cylinder, patented first in 1822 and afterward in 1832, he also invented a process for preparing and dressing pulp; a process for sizing paper; a knife for cutting and trimming, and a process for drying.

After the invention and improvement of the cylinder, by Gilpin, Ames and others, further changes and improvements in paper-making followed. At first the revolving mould or cylinder was turned by hand in the vat, and the wet web of paper was taken off by an endless felt running between rollers that pressed the water out, leaving the paper sufficiently strong or dry, to be wound upon a drum. When a thickness of four or five inches had accumulated on the drum this was cut by a large knife or saw blade, and then divided into packs of sheets of the desired size. The sheets were taken to the loft and air-dried as those that were hand-made. The felt used with the machine was continually getting filled with the soft pulp so that much paper was spoiled. At the end of a few hours' run the felt had to be removed and washed which made trouble and occasioned loss of time.

Altogether the process was still slow and far from satisfactory, although in results better than anything before known. An experiment in sprinkling the felt with water to keep it a little more clean led to the invention of the felt-washer or beater and soon came the dryer to meet another "long-felt want." The dryer, designed to dry the paper in the web or the continuous sheet, and thus do away with the primitive and laborious loft drying, was an iron cylinder, generally about ten feet in diameter; in this was arranged a stove heated with wood fed into it through a

door in the cylinder. After this came the steam dryer, the cylinder washer in the rag engine, the machine for sizing paper in the web, size rolls for sizing paper without felt or jackets, the lay-boy for taking paper from the machine, and the wet lay-boy for handling wet paper.

In 1830 Phelps & Spafford of Connecticut, manufacturers of paper-making machinery, constructed a complete machine with making-cylinder, press-rolls, steam-drying cylinder, reels and cutter, connected, so that at last it was possible for the paper-maker to take in the pulp at one end of his machine, make the paper, dry it, cut it into sheets of the desired size and turn it out ready for finishing or packing at the other end of the machine. All this had been accomplished in this country while the Fourdrinier machine, finally more famous, was being experimented with in England and introduced into the industry abroad.

Inventions generally during this period ranged over a rather narrow field, for the industry had not yet broadened much in its aims or its processes. Principally they included the original cylinder machines and improvements upon them; methods for making pulp from various fibres; the sizing and cutting paper; moulds and other minor applitreatment of rags; machines for drying, finishing, pressing, ances. As has already been pointed out, the foremost inventors were Thomas Gilpin and John Ames. Following close after those two, in the importance of ideas, were Isaac Sanderson of Milton, Mass., with an improved cylinder; Henry P. Howe of Shirley, Mass., with a drying machine; and William Magaw, with a process of making pulp from straw.

Other less noted patentees were: John McClintic and George Faber, Chambersburg, Penn.; Francis B. Howell, Lockport, Ohio; John Shugert, Quincy, Penn.; Edward Pine, Troy, N. Y.; Jonas Bateman, Harvard, Mass.; John M. Hollingsworth, Braintree, Mass.; Clarke Rice, Watertown, N. Y.; James Sawyer, Irah White, L. Gale and Solomon Stimpson, Newburg, Vt.; Peter Force, Washington, D. C.; Hez[ekiah] Steele, Hudson, N. Y.; Francis Bailey, Salisbury, Penn.; Richard Waterman and George W. Annis, Providence, R. I.; Thomas Longstroth, Bucks

county, Penn.; Charles Kinsey, Essex, N. J.; Isaac Burbank and Gardiner Burbank, Worcester, Mass.; Andrew Sprague and Nicholas A. Sprague, Fredonia, N. Y.; Joseph Truman, Bridgeport, Penn.; Charles Forbes and William Debit, East Hartford, Conn.; Reuben Farchild, Trumbull, Conn.; Burgiss Allison, John Hawkins and Joseph Condit, Jr., New Jersey; Thomas Trench and Asahel H. Jervis, Ithaca, N. Y.; John W. Cooper, Washington township, Penn.; Elisha H. Collier, Plymouth, Mass.; Samuel Green, Henry Clark and William Albertson, New London, Conn.; Mason Hunting, Waterbury, Conn.; Frederick A. Taft, Dedham, Mass.; Phares Barnard, Whitestone, N. Y.; George Bird, Walpole, Mass.; William Coolidge and Michael Morrison, Boston; Homer Holland, Westfield, Mass.; Edmund Blake, Alstead, N. H.; Joseph Robeson, Montgomery, Penn.; James P. Howland and Alfred Griswold, Muncey, Penn.; Joseph Woodhouse, Otsego, N. Y.; Joseph Hartshorne, John Reich, Edward Starr, Parke Shee, Jacob Perkins, Coleman Sellers and Samuel Eckstein, Philadelphia; Benjamin Mestayer, Ephraim F. Blank, Thomas Blank, John B. Pignatelle and Marsden Haddock, New York; Elihu H. Thomas, Samuel E. Foster and Nathan Woodcock, Brattleboro, Vt.; Sidney A. Sweet, Tyringham, Mass.; Francis Goucher, Chester county, Penn.; George Carriel and Enoch Burt, Manchester, Conn.; Isaac Fisher, Jr., Springfield, Vt.; Benjamin Cox, Northampton, Mass.; Robert Carter, Elkton, Md.; Moses Y. Beach and Abram Frost, Springfield, Mass.[184]

During the forty-five years next after 1838 there was a decided quickening of the inventive impulse in the paper-manufacturing field. Whereas in the first part of the century only eighty-eight patents had been taken out, an average of only a little more than two a year, there were now taken out one thousand and seventy-three, an average of more than thirty a year. Of this number, nine hundred and twenty-five were for various kinds and modifications of machinery and for methods of making paper; two hundred and fifty-four were for machinery and methods for

[184] Henry L. Ellsworth: *A Digest of Patents Issued by the United States from 1790 to January 1, 1839,* (1840), pp. 112-114.

treating rags and making pulp; seventy-nine were for making paper-bags; ninety-five were for making paper-collars, and sixty-six for making paper-boxes.[188]

The old mill-men were slow in approving the new machines, long clinging tenaciously to the hand process. In this they were only giving another exhibition of the characteristic antagonism of workers in all times against the introduction of machinery in all industries. An incident has been related illustrating this aversion to the new methods, in a mill where cylinders had been introduced. "Gears had been ordered to admit of speeding the machine ten feet per minute faster, on hearing which the old machine-tender, who was short and fat, expressed himself by stating that when a machine was run faster than a man could walk it was time to quit; and quit he did."

The application of power in the second quarter of the century and the gradual introduction of the paper-making machines brought about decided changes in the industry. Before that, labor was high and consequently the cost of production was excessive. To a certain extent machinery remedied this. The Hollander, the cylinder and the Fourdrinier were improved again and again and other mechanical expedients, simple but efficient, were devised. Especially in the United States manufacturers made more progress than in France and England, in the practical utilization of the new machines and new processes. Turning attention to producing the best qualities of paper they were soon able to place their machine-made paper in successful competition with the foreign hand-made.

This much had been quite surely accomplished by the middle of the century. Nearly all the mills, particularly those that were newly built, had been equipped with Hollanders, Fourdriniers or cylinders and other machinery. Even the old single-vat mills had come into line and there remained few of importance that any longer made pretense of manufacturing paper by hand.

[188] M. D. Leggett: *Index of Patents for Inventions Issued by the United States Patent Office from 1790 to 1873, Inclusive,* (1874).

CHAPTER TEN

A CENTURY AND A HALF OF GROWTH

FEELING THE STIMULUS OF THE NEW MACHINERY—TARIFF AGITATION—MILLS IN THE EAST GROW IN SIZE AND IMPORTANCE—BEGINNING THE INDUSTRY IN INDIANA AND OTHER STATES—MAKING STRAW-PAPER IN COLUMBIA COUNTY, NEW YORK—MILL STATISTICS FROM THE DECENNIAL CENSUS OF 1840

BY the time that the first quarter of the nineteenth century had passed, there were signs that the industry was well on its way to a development commensurate with its importance to the general interests of the growing nation. New machinery and changes in methods of manufacture and in materials used, comparatively slight though these were as yet, were giving a considerable impetus to paper-making. The cylinder machine and the Fourdrinier, which came into the field practically together, were already in the way of producing abundant and weighty results; and at the same time lesser improvements in machinery and methods were demonstrating their usefulness. Testimony of a paper-manufacturer of that period may be cited to advantage in this connection. Writing in 1850, James M. Willcox of the Pennsylvania Ivy Mills referred to the advance that had been made in his time, particularly by the introduction of machinery and various improved methods. Among other things he said:

> "The interval from 1830 to 1840, was important for the vast improvements made in the manufacture, by the application of machinery, and, also, by the introduction of the use of chlorine in the form of gas, of

chloride of lime, and the alkalies, lime and soda-ash in bleaching, cleansing, and discharging the colors from calicoes, worn-out sail, refuse tarred-rope, hemp, bagging, and cotton-waste, the refuse of the cotton mills. These articles, which heretofore had been considered only applicable for the manufacture of coarse wrapping papers, have, through the application of this bleaching and cleansing process, entered largely into the composition of news and coarse printing papers, and consequently have risen in value 300 per cent.

"A few mills possess machinery, and adopt a process by which they are prepared for the finest printing and letter paper. I have seen a beautiful letter paper made of cast off cable-rope. Hemp-bagging is an excellent material for giving strength, and is in great demand, especially for making the best newspaper. The cost of making paper by machinery, compared with that of making it by the old method, (by hand), not taking into account the interest on cost, and repair of machinery, is about as one to eight. The present low price resulting from improved machinery; and the low price of printing by steam power has placed newspapers and books in the hands of all; and a great increase of production has followed within the last few years."

In the same letter Mr. Willcox spoke of the gradual changes in the distribution of the industry that were going on under his observation as the middle of the century was reached. On this point he said:

"There has been a greater proportional increase of mills in the middle and western states within the last ten years than in the east. Ten years ago I suppose 80 per cent. of the supplies for Philadelphia, came from east of the North River; at present, I think there does not come 20 per cent. Formerly, a much greater quantity was sent west of the mountains, and large quantities of rags brought in return. In consequence of the greater number of mills in the west, particularly in Ohio, New Orleans, I am informed, is in a great measure getting supplies there. Formerly they all went from the Atlantic states.

"From the time of the Revolution, the quantity of paper imported has been gradually decreasing; and before the revision of the tariff in 1846, had dwindled

> to perhaps not more than 2 per cent. of the amount consumed, with the exception of wall papers, of which large quantities were imported and still continue to be from France. Since 1846, there has been an increase of cheap French letter paper, but the amount is small compared with the whole amount of letter paper consumed—probably not more than 3 per cent. There is also a small quantity of ledger and letter paper brought from England; but as the American is quite equal in quality, the importation is gradually diminishing. Within the last two years, great ingenuity has been exercised both in England and in the United States, in trying to make a paper by machinery, to resemble the old fashioned hand made *laid* paper, (yet preferred by many.) To the eye, it is a pretty good imitation, but lacks the toughness, firmness and surface of the hand made. By an experienced judge, the deception is easily discovered. Notwithstanding, large quantities have been used under the supposition that they were hande made." [186]

In 1828 the newspapers of New York state consumed annually fifteen thousand reams of paper, the price for which was from four to five dollars a ream. All the newspapers in the United States used about one hundred and four thousand reams, valued at half a million dollars. This, although not the only source of increased demand upon the mills, was, with book publishing, quite the largest, and to meet it many new mills came into existence with machinery and other improvements. Expansion of individual plants at increased cost naturally followed. Where before it was possible to build and equip a fairly good mill for $10,000 or less, an investment would now represent at least double, triple or quadruple that amount and even more. A few examples are worth quoting. They are losses or costs reported upon mills that were burned between 1832 and 1850: Wiswall & Flagg, Exeter, N. H., 1833, $12,000; Laflin, Lee, Mass., 1833, $20,000; Lyons, Newton Lower Falls, Mass., 1834, $50,000; Brown, Tower & Co., Hampden, Me., 1835, $20,000; Peabody, Daniel & Co., Franklin, N. H., 1837, $20,000; Carleton & Co., Shir-

[186] *Report of the Commissioner of Patents for the Year 1850*, (1851), p. 405.

ley, Mass., 1837, $25,000; R. L. Underhill & Co., Urbana, N. Y., 1838, $32,000; A. Bradley & Co., Dansville, N. Y., 1838, $20,000; Phelps & Field, Lee, Mass., 1840, $20,000; Charles Perham, Groton, Mass., 1842, $16,000; Sharpless, Huskins & Wallace, Fayette county, Penn., 1844, $20,000; Hollister, Windsor Locks, Conn., 1846, $12,000. These were mills of ordinary size and value. Many were smaller and comparatively insignificant. A few establishments, like those of the Gilpins and the Ameses, for example, went much higher in value.[187]

Greater efficiency also resulted. In 1831 *The New York Journal of Commerce,* commenting upon these improvements, said that development had been so great in the preceding five years that it now used on its presses a sheet of paper one-quarter larger than before and costing one-quarter less. As years passed progress was more and more marked. The large mills steadily increased capacity and in every way adapted their methods of manufacturing and supplying the market, to the new and changing business conditions. In 1848 *The New York Journal of Commerce* again expressed its astonishment at what was happening in the paper trade:

> "We were informed a few days since, by a large paper dealer in New York, that it was not uncommon for him to have in his warehouse, and sell at nine o'clock in the morning, paper which was in *rags* a hundred and fifty miles from New York at nine o'clock of the previous morning. A better illustration of the power of steam could not be given, or of the progress of the age. The rags are placed in the duster, thence conveyed to the troughs or vats, where (in some kinds of paper) the sizing is mixed with the pulp, and from these vats the paper passes over heated rollers, and finally between two immensely heavy iron rollers, which give it the glazed surface, and it is then cut, folded, packed, and sent to the railroad, all in the course of a few hours. The telegraph enables New York merchants to order paper in Massachusetts at any moment, and receive the returns, manufactured, and even ruled, by almost the next steamer."[188]

[187] See page 146, *ante.*

[188] Freeman Hunt: *The Merchants Magazine,* XIX., p. 342.

In the tariff agitation which prevailed between 1825 and 1860, the manufacturers of paper did not take conspicuous part. Their interests were overshadowed by those of other industries, particularly, iron, cotton and wool. They made themselves heard however and were represented in the various conventions of the time. An anti-tariff convention was held in Philadelphia, September 30-October 7, 1831, about two hundred delegates being present from fifteen states in the union. Resolutions were adopted expressing opposition, on constitutional grounds, to the tariff then existing, as far as it was designed to protect manufactures. A memorial embodying the views of the convention was prepared by a committee, of which Albert Gallatin was chairman, and was presented to congress, in the senate, February 9, 1832. In connection with this memorial were various "expositions pertaining to different manufacturing industries." Regarding the manufacture of paper it was stated:

> "The duty on printing paper, not sized, is ten cents per pound, which is about 130 per cent. on the price in France and Italy of that quality which is most used here. This duty operates as a prohibition, and the price of the domestic article is probably increased by it, from 5 to 7 cents per pound. Thus the paper-makers have a monopoly, which is uncompensated by the publishers, and by checking the increase of production, is collaterally burthensome to the printers and bookbinders.
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> . . . . . .
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> "The duty on paper, which is 10 cents per lb. on unsized, and 17 cents per lb. sized, might be considerably reduced without injury to the makers, for the price is not raised by the whole amount of the duty; and they would be compensated by a great increase of demand; and they are protected by their raw material, rags, being duty free."[189]

In the same year, a month later, October 26, the supporters of the protective tariff met in New York in a Convention of the Friends of Domestic Industry to con-

[189] *The New York Evering Post*, October 1-10, 1833. Duff Green: *Public Documents, Senate of the United States, 1st Sess., 22d Cong.*, (1832), I., Doc. 55.

sider measures "for the support and further extension of the American system as involved in the protection of domestic industry." Delegates to the number of five hundred and twenty-five were in attendance from thirteen states and the District of Columbia. A committee appointed to consider the subject of the production of paper consisted of Jonathan Seymour and Hector Craig, of New York; Charles Stearns, of Massachusetts, and Augustus Greele: it does not appear that this committee made any report. A memorial from the permanent committee of the convention was presented to the national house of representatives in January, 1833.[190]

Following the beginning in Berkshire county, Mass., other mills were built in Lee, soon after 1826, by Walter, Winthrop and Cutler Laflin and Stephen Thatcher. Besides these, numerous other manufacturers came in. To catalogue all of them and record in detail their business activities would fill a goodly-sized volume. Prominent, in addition to those already spoken of on preceding pages, were John Bottomley, Harrison Smith, Sylvester S. May, Jared Ingersoll, Joseph Bassett, Thomas Sedgwick, Joseph B. Allen, David S. May, E. S. May, George Wilson, C. C. Benton, P. C. Baird, Harrison Garfield, Thomas Owen, Henry C. Hurlbut, S. S. Rogers and others in Lee; Wheeler & Gibson, John Carroll, Beach & Adams and others in New Marlboro; B. B. Doten, and A. A. Mansfield in Sheffield; Riley Sweet, Asa Judd, George W. Platner, Elizur Smith, Ezra Heath and Joshua Bass in Tyringham; L. L. Brown, William Jenks and Daniel Jenks in South Adams; the Cranes, the Chamberlins, the Carsons and others in Dalton. The mills built, burned and rebuilt in this region, during this half century and a little more, were over forty in number.

One of the Berkshire mills, which became famous in the annals of the business, was the Columbia built by the Laflins in Lee in 1826, their second mill. In its early

[190] Hezekiah Niles, Secretary: *Journal of the Proceedings of the Friends of Domestic Industry,* (1831). Duff Green: *Executive Documents, House of Representatives, 2d Sess., 22d Cong.* (1832), II., Doc. 78.

career it had several owners and operators, conspicuous among whom were George N. Phelps and Marshall Field. The junior member of this firm was in much later time the great Chicago merchant and philanthropist. A younger brother of Field—Cyrus W. Field—worked in this mill as a boy. Afterward, from about 1840, he was a dealer in paper in New York city and there acquired a reputation of being one of the shrewdest men in the trade. Identification of his name with the first Atlantic telegraph cables has quite eclipsed recollection of him as a paper-maker and paper-dealer.

Charles M. Owen and Thomas Hurlbut who, in 1822, acquired the Church mill in Lee, soon attained a leading position among the Berkshire manufacturers. They secured control of the entire Housatonic water power and went in for factory improvements, setting up a cylinder in 1833, a calender in 1834 and a ruling machine in 1836. Then they built another mill in Housatonic. In 1860 the firm was dissolved by mutual consent. Owen kept the Housatonic property and Hurlbut the mills in South Lee. Both took their sons into partnership and thus the Owen Paper Company of Housatonic and the Hurlbut Paper Company of Lee came into existence. Hurlbut died in 1861 and Owen in 1870.[191]

Toward the middle of the century Newton Lower Falls developed into the notable paper-manufacturing center of eastern Massachusetts. Among the leading owners and operators there were William Hurd, Amos Lyon & Co., William Parker, Joseph Foster, Moses Garfield, Lemuel Crehore, William Curtis, Amasa Fuller, Joseph H. Foster, Thomas Rice, Charles Rice and John Rice. One mill, which was built soon after 1800 by William Hoogs, had the record of passing successively through the hands of nearly all those paper-men until it finally became the property of Augustus C. Wiswall & Son by whom it was operated in the closing years of the century to the time of its demise.

Earliest among the paper-makers of Newton Lower

[191] C. M. Hyde: *Centennial History of the Town of Lee, Mass.*, (1878), p. 294.

Falls were Simon Elliot, and Solomon Curtis. Allen C., and William Curtis, sons of Solomon Curtis, acquired the Curtis and Elliot mills in 1834 and, with new build-

LEMUEL CREHORE.
Founder of the Crehore Paper-Mill Interests in Eastern Massachusetts.

ings, modern machinery and other improvements, continued business until toward the end of the century.

The Crehore family interests in paper-making in Newton Lower Falls began in 1825 when Lemuel Crehore, who had learned the trade in the old Milton mill, estab-

lished himself in business with William Hurd. Mr. Crehore, in 1834, purchased the John Ware paper-mill of 1789 and, with partners or alone, maintained the business for twenty years. As he advanced in life he associated with him his sons, George C. and Charles F. Crehore. He died in 1868. In the third generation the business passed into the hands of Frederic M. Crehore, son of Charles F. Crehore, continuing in name as Charles F. Crehore & Son. From the start the Crehore mills made a specialty of press board and jacquard cards.[192]

Another family of paper-makers conspicuous in Newton for three-quarters of a century was that of Rice. Before 1800 Thomas Rice was a paper-maker in Needham. About 1810 he moved to Newton Lower Falls, where he owned a mill in which his son, Thomas Rice, Jr., learned the trade. The second Thomas Rice became an eminent manufacturer, controlled many extensive business interests and was active in public affairs. He died in 1873. Associated with him in paper-manufacturing was his brother Alexander H. Rice, mayor, congressman, governor of the state and otherwise prominent. The Rice mills, on the Wellesley shore of the Charles river, were originally owned by Wm. Hurd, Rice & Garfield and Amos Lyon.

In 1829 there were sixty mills in Massachusetts, only six of which used machinery. About one thousand seven hundred tons of rags were consumed, annually, producing paper to the value of $700,000. No gathering of statistics concerning the manufactures of the state was systematically undertaken until eight years later. In 1837 the general court of Massachusetts directed the assessors in the towns of the commonwealth to return to the secretary of state information in regard to the various branches of industry in the state. The secretary of state made a report, which was published in 1838.

In this report the returns for paper-manufacturing showed that then there were in operation in the state eighty-nine mills, located as follows: twelve in Lee, six

[192] D. Hamilton Hurd: *History of Middlesex County, Mass.*, (1890), III., 102.

in Needham, five each in Newton and Leominster, four each in Springfield and Milton, three each in Dedham, Pepperell, Harvard and South Hadley; two each in Braintree, Dorchester, Walpole, Swanzey, Methuen, Framingham, Shirley, Watertown, Fitchburg, Hardwick, Worcester, Amherst and Dalton; one each in Middleton, Groton, Sudbury, Waltham, Athol, Auburn, Millbury, Northampton, Blandford, New Marlborough, Tyringham,

THOMAS RICE, JR.
Identified with the Industry in Eastern Massachusetts.

Fairhaven, Taunton, Bridgewater and Wareham. The total amount of capital invested was $1,167,700, the number of employees were five hundred and sixty-eight males and six hundred and five females, and the annual product was nine thousand and nineteen tons of paper valued at $1,544,230.

This list of towns is more than locally interesting in many respects. Particularly it was broadly typical of the [illegible] of the trade in other states where paper-manufac-

turing had gradually grown from narrow, tentative existence into a condition of industrial importance. The wide distribution of the mills throughout the state is noticeable. Transportation of raw material from sources of supply, and of manufactured stock to the markets, was still a serious problem which railroads had not yet come to solve. Consequently the mills were compelled to be mostly local, wherever good water-power could be found.

Concentration in situations specially advantageous to the prosecution of work had only begun to set in. The first indication of that was to be seen in the grouping of twelve mills in Lee, two in Dalton, four in Springfield and three in South Hadley, thus making a paper-manufacturing center in western Massachusetts; and also in the grouping of six mills in Needham, four in Milton, five in Newton, three in Dedham, two in Dorchester, two in Walpole, two in Braintree and two in Watertown, another center about Boston in the eastern part of the state. There was another group of seventeen mills in the central part of the state.

In 1845 another similar industrial census was taken in Massachusetts under the direction of the secretary of the commonwealth, the enumeration being made by the assessors of the cities and towns. The work was accomplished with a fair degree of thoroughness and accuracy and all things considered was as satisfactory as could reasonably be expected, although the final report made the qualification that: "It is probable that the statements are far from presenting a complete view of the industry of the commonwealth." From this report it appeared that there were then in the state, eighty-nine paper-mills, twenty being in Norfolk county, twenty in Berkshire, eighteen in Middlesex and eleven in Worcester. From this it can be seen that the localities where the industry had been first established still maintained their predominance and that Berkshire where paper-making had been last begun, in 1801, had overtaken Norfolk where it was first begun in 1728. In all the mills of the state one thousand three hundred and sixty-nine persons were employed; $1,144,537 of capital were invested; 15,886 tons

of stock were annually consumed; 607,175 reams of paper, valued at $1,750,273, were annually produced.[193]

Connecticut still held its position as a leading paper-manufacturing state, ranking fourth in the amount of annual production, by the census of 1840. Most of the printing-paper was used by the newspapers of the state and by the publishers of books in Hartford. Then Hartford was a publishing center, being surpassed only by New York, Philadelphia and Boston. Considerable of the paper-making was concentrated in Hartford county, especially in and about the town of Manchester, on the Hockanum river.

In a little Manchester settlement called Union village, Butler & Hudson erected a mill before the end of the eighteenth century and about 1838 this came into the possession of Increase Clapp, Timothy Keeney, James B. Wood and Sandford Buckland, partners under the name of Clapp, Keeney & Co. Paper shavings were used in the manufacture of paper, the stock being taken from the book binderies in New York. In 1850, upon the death of Mr. Clapp, the Keeney & Wood Manufacturing Company succeeded to the business. Also in Manchester, in the village of Oakland, Henry Hudson converted an old grist mill into a paper-mill that was managed for thirty years by the Hudsons—Henry, Melancthon, his son, and William and Philip W., sons of Melancthon. For many years the mill was run on contracts with the United States. Subsequently the Cheney Brothers—better-known as manufacturers of silk—came into possession of the property and they rebuilt the mill and improved the plant. After 1878 the mill was owned by the Hurlburt Manufacturing Company, operating there as the Oakland Paper Company.[194]

Peter Rogers and his son, Henry E. Rogers, were prominent in the industry for a half century. The father

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[193] John G. Palfrey, Secretary: *Statistics of the Condition and Products of Certain Branches of Industry in Massachusetts, for the Year Ending April* 1, 1845, (1846).

[194] J. Hammond Trumbull: *Memorial History of Hartford County*, (1886), II., 256.

was a partner in the Buckland mill in 1825 and after 1832 had a mill solely his own where he made press-boards and binders-boards. His son built a new mill in 1849 with a capacity of one and a half tons per day and it has been asserted that he was the first to use old printed paper for stock, having a process for extracting the ink.

Humphreysville, in Seymour, did not long hold the position that had been given to it by the mill started by General David Humphrey in 1801, although several mills of note were there. Six or eight mills were built, burned and rebuilt between 1825 and 1850 and the principal operators were Gilbert, Beach and Co., Lewis Bunce, the Rimmon Paper Company, De Forest & Hodge, Smith & Bassett, John S. Moshier, Daniel White, John C. Wheeler and Sylvester Smith. In the mill built for John S. Moshier in 1831 the first straw paper made in Connecticut was produced in 1837 when Smith & Bassett were operating it on lease.

For fully fifty years Columbia county in New York state was noted for making paper from straw. Before 1825 there had been mills in this region, small affairs making paper of the regulation kind and in the regulation manner. In 1830 two paper-makers—Hamilton and Wright—came from Connecticut to Chatham Four Corners. They brought with them knowledge of the workings of the new cylinder and plans of the machine which they had surreptitiously obtained. Purchasing a site on the banks of the Steinkill where Eleazer Cady, with one small beating-engine, had been making paper by the hand process for several years, there they built a machine and were the pioneers on straw wrapping-paper in that section of the country. In 1832 the partners separated, Hamilton retaining the mill while Wright started a second establishment with a cylinder, in an old saw-mill plant on the same stream. During subsequent years this property passed successively through the hands of Cornelius Shufelt, Rathbone & Simmons and Staats D. Tompkins.

A third mill for straw paper was erected by Ebenezer Backus and Thomas Wheeler not far from the first Hamilton & Wright mill. It was locally known as "the mud-

mill" on account of the generally dirty condition of the water of the brook from which its supply was drawn. William Davis and Plato B. Moore purchased, in 1837, an old fulling-mill on the Steinkill, between Chatham and Chatham Four Corners and started there the fourth mill in the county. About a year later Phillip Winnegar and Plato B. Moore built a mill near Queechy lake.

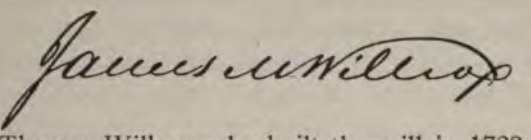
These four mills were the pioneers in the making of paper from straw, in this county. Rye straw for stock came from the farms around about and was abundant and cheap. The paper was not exclusively straw, about twenty per cent. hard stock—rope and bagging—being used to make the sheet run good. The mills of Wright and of Backus & Wheeler had fire-dryers, being the first straw mills in which paper was not loft-dried.

Presently the making of paper from straw flowed over the border line of Columbia into Rensselaer county. In 1845 John B. Davis purchased a site for a mill on Kinderhook creek, in the town of Nassau, and in the following year, associated with Peter C. Tompkins, he built the first mill for making straw wrapping in that county. It was the largest mill that had yet started on straw, planned for four thirty-inch Hollanders and a thirty-six inch cylinder. With two engines and a drying-loft, in the beginning, after a few years the mill had other engines, a forty-inch cylinder and steam-dryers. It had two large square bleach vats whereas prior to this date the mills of Columbia had only one. Eventually Tompkins sold his interest in this mill and the business was continued by D. P., C. F., and Oscar Davis, sons of John B. Davis.

Upon relinquishing his interests in Rensselaer, Peter C Tompkins returned to Columbia where he took possession of and completed a new mill that his brother, Staats D. Tompkins, was building on the Steinkill near East Chatham. He ran that successfully for many years and was the first manufacturer to make wrapping exclusively from straw without hard stock.[195]

[195] *Columbia County at the End of the Century,* (1900). Franklin Ellis: *History of Columbia County, New York,* (1878). *The Paper Trade Journal,* October 16, 1897, pp. 84-88-90.

The Ivy Mills of the Willcox family in Chester, Penn., were still at the height of their prosperity at this time, more than one hundred years from their beginning, and in every way they still ranked among the leading establishments of the country. On preceding pages[196] reference has been made to the succession of ownership after 1800. Joseph Willcox, son of Mark Willcox and grand-



son of Thomas Willcox who built the mill in 1728, came into the business in 1808 and his brother, John Willcox, joined him in 1815. Another brother, James M. Willcox, became manager of the mill in 1826 upon the death of his brother, and inherited the property in 1827 when his father died. After the death of James M. Willcox, in

[196] See page 13, *ante*.

1854, the mill was run by his sons, Mark, James M. and Joseph Willcox, under the firm name of J. M. Willcox & Sons, until 1859. Then it passed into the hands of a younger son, Henry B. Willcox, who continued to operate it until 1866 when the business of hand-made paper was abandoned. For nearly one hundred years and in the possession of three generations of the Willcox name, the Ivy Mills were mostly devoted to the manufacture of hand-made bank-note paper, and in this they were pre-eminently distinguished. The record is remarkable and has not been surpassed, even if rivalled, by any other concern in the industry.

In 1829 the old mill, which had been running one hundred years without interruption, was torn down to make way for another building on the same site. Two other buildings were added at Glen Mills, two and one-half miles from Ivy Mills, one in 1837 and the other in 1845. In both these, machine-made paper was produced. During the first year of the civil war the demand from the United States government for bank-note paper was so large that the facilities of the "hand-made" mill were overtaxed and much of the paper was machine-made in the two mills that had been last built. The Glen mill was in operation into the twentieth century but no longer by those of the Willcox name.

Paper-making in Indiana was begun by Isaac Mooney in 1826. Mooney, who had been employed in paper-mills on the Little Miami river in Ohio, went to Indiana and there erected a two-vat mill, the first in the state, on the Big creek, about twelve miles north of Madison. Within a year Mooney died, a suicide, and his mill was bought by Alfred McDaniels who had a paper-warehouse in Cincinnati and was also selling agent for Kugler of Milford and Phillips & Spear of Cincinnati. McDaniels, after a short time, sold the mill to Hezekiah Stout who converted the plant into a grist-mill, that being the end of the first attempt to start the manufacturing in the Hoosier state.

In 1827 a second two-vat mill was built, by John Sheets, a native of Virginia, who had been living in Warren county, Ohio. This was located on Indian Kentuck

creek, seven miles east of Madison. In 1832 a machine was put in and the first air-dried binders' boards in Indiana were made. Later, this also became a grist mill.

Leeds, Jones & Bissell built a one-vat mill in Richmond, Ind., in 1831. The mill had a single one hundred and twenty-five pound beating-engine and within ten years another vat, a second engine, a wet-machine and a fire-dryer increased the plant. These additions indicated the general character of the gradual improvements in all the small mills of the western country in this period. In 1837 the business of this mill was incorporated and, in the possession of various owners, among whom were J. R. Mendenhall, Thomas Newman, and Charles Nixon, it existed until after the middle of the century.

Another mill in Indiana was built between 1835 and 1840, near Madison, by James Hamilton and Henry Jackman. For three years only it was operated on wrapping-paper and then was abandoned. Other mills of Indiana in this second quarter of the century were: the Spier in Brookville, Franklin county, which was equipped with machinery brought from Cincinnati in 1834; that of William Sheets and Daniel Tondes in Indianapolis, from 1838 to 1866, the machinery finally being removed to Illinois; that of Daniel Tondes in Lafayette, in 1841, which survived under other owners, Wilson, Hanna and Barber, until 1874, being run on writing, print and wrapping; that of Hanna & Wilson, which made print and wrapping until it was burned in 1857; a second mill erected in Indianapolis by Thomas McIntyre and Jeremiah McLane, two partners, whose special qualifications for making paper seemed to be that one—McIntyre—was superintendent of a deaf and dumb asylum while the other—McLane—was a silver-smith.

Several other mill enterprises in Indiana dated from the mid-century. For about twenty years, Rhinehart & Robertson, Rhinehart & Wood and Rhinehart & Bowen successively operated the first mill in Delphi, built by George Robertson in 1846, burned in 1849 and rebuilt in 1851. The mill was run mainly on wrapping and news. Another mill in Delphi was built in 1853 by Robertson

& Wood. In 1859 Beckett & Gridley built the third mill in Delphi, equipping it with four engines and a sixty-two inch double cylinder. Both owners were spiritualists, and it has been said that while the mill was under construction they held nightly seances and were instructed by ghostly advisers in the work of building and setting up the plant. But their familiars appear to have been evil spirits for the mill was a failure from the start and within a year was burned.

The first mill in Logansport was built in 1857 by William Archer & Son and was operated, first by the Archers and then by James L. Baldwin, until 1868 when it was dismantled and the building transformed into a distillery. A second mill near Logansport was owned and operated by Eldridge and Bachman. The first mill in Elkhart was built in 1850 by E. R. & C. Beardsley. It was located on Christiana creek and had a fifty-six inch cylinder. Six or seven years later another mill was added under the same roof. Later, a sixty-two inch machine was put in for the purpose of running on print-paper, the other machine being used exclusively on wrappings. The mills were the foundation of the Elkhart Paper Company which became the owners in 1868 and enlarged and improved the plant.[197]

A pioneer Methodist preacher named Lamden founded the industry in West Virginia. He was proprietor of a paper-mill built in Wheeling, on the Ohio river, in 1830. His son, Christopher Lamden, had learned the trade of paper-making by hand in the old mill in Steubenville, Ohio, and by machine in Massachusetts. The Wheeling mill was equipped with a machine. The Lamdens made tea and wrapping-paper and found a ready market for their goods. In 1835 the mill was burned but it was rebuilt in the following year and was then known as the Virginia mill. Afterwards it passed into other hands and made bonnet boards and wrapping-paper.

In 1832 the Fulton mill was built by Alexander Armstrong, Archibald Fisher, Joseph Morrison and Frederick

[197] *The Paper Trade Journal*, October 16, 1897, p. 104.

Trendley, the last named being the practical paper-maker and the superintendent. During the next twenty-five years or more the mill passed through several hands, among its successive owners being R. Crowl, the Armstrong brothers, Levis, Little & Co. and Spence & Hanna. At the height of its activity, it was run on both fine and printing papers, its daily capacity being about one thousand five hundred pounds of news.

Early efforts to start paper-making in Kentucky were not pre-eminently successful and the industry in that state had a very precarious existence.[198] After the first mill in Louisville, in 1814, a second in that city was started about 1830 or 1832 and had a brief and inglorious career. Originally it was a saw-mill located in the woods adjoining the town, and when all the trees which could be cut for lumber were used, Bainbridge & Syler, the proprietors, changed their saw-mill into a paper-mill. It ran for about three years and was then burned. The third mill in Louisville, built about 1836, was operated by Nixon & Kellogg and was subsequently purchased by the owner of *The Louisville Advertiser*. Later it became the property of Prentice & Co.; in 1840 it was rebuilt at a cost of $9,000, but a few years later it was sold under the hammer to Isaac Cromey for $14,000. This was the first mill operated in Louisville by Dupont & Co. In the winter of 1832-33 a flour-mill in Mayville, Jessamine county, about seventeen miles from Louisville, was changed into a paper-mill, having an equipment of two engines and a cylinder machine. It was operated by the Messrs. Warnack for about two years and then changed back into a grist-mill.

It is small cause for wonder that, after the lugubrious failures of 1810 and 1820, no attempt was again made to gather statistics of manufacturing throughout the country until the census of 1840 was ordered. But the third decennial effort was not much of an advance over those that had preceded it, being meagre in detail and very inaccurate. The returns gave the aggregate amount

[198] See page 169, *ante*.

of capital invested in all manufacturing in the United States as $267,726,579 and the number of persons employed as 399,307. The actual facts, however, were undoubtedly in excess of those reported by the official enumerators.

The number of paper-mills reported were four hundred and twenty-six in twenty states and the District of Columbia men employed, four thousand two hundred and twenty-six; with no record of female employees, of whom there were many; capital invested, $4,745,239; annual value of product, $5,641,495. The industry was still largely confined to the eastern part of the country. Massachusetts, with eighty-two mills, was first in capital invested, $1,082,800; in number of employees, nine hundred and sixty-seven; in value of product, $1,659,930. Pennsylvania had eighty-seven mills; capital, $581,800; employees, seven hundred and ninety-four; product, $782,335. New York had seventy-seven mills; capital, $703,550; employees, seven hundred and forty-nine; product, $673,121. New Jersey had forty-one mills; capital, $460,100; employees, four hundred; product, $562,200. Connecticut had thirty-six mills; capital, $653,800; employees, four hundred and fifty-four; product, $596,500.

In addition there were other manufactures of paper, including playing cards, etc., to the annual value of $511,597, of which Pennsylvania produced $95,500, New York, $89,637, Ohio, $80,000, Connecticut, $64,000, Massachusetts, $56,700, Indiana, $54,000, Vermont, $35,000 and Tennessee, $14,000. Apparently there were no mills in Arkansas, Alabama, Florida, Georgia, Mississippi, Louisiana, Iowa, and Wisconsin.[199]

[199] Freeman Hunt: *The Merchants' Magazine,* VI., pp. 290 and 371; IX., pp. 140 and 220. United States Census Office: *Compendium of the Enumeration of the Inhabitants and Statistics of the United States, Sixth Census,* (1841), p. 363.

CHAPTER ELEVEN

THE SEARCH FOR RAW MATERIAL

SCARCITY OF THE STAPLE LINEN STOCK EVER PRESENT—NUMEROUS VEGETABLE FIBRES ARE TRIED—CURIOUS TALES OF MANY HOPEFUL EXPERIMENTERS—STRAW THE FIRST CONSIDERABLE ADDITION—FINALLY, PULP FROM WOOD COMES IN AND REVOLUTIONIZES PAPER MAKING—THE GREAT WOOD PROCESSES

VOLUMES have been written and other volumes might still be written about man's quest for material for paper, and without exhausting the subject. Trouble began immediately with the discovery of the utility of a pulp prepared from vegetable fibre. For their raw material the Chinese, who first used this new process, took rice, the bark of the mulberry tree, bamboo, cotton, linen and hemp. But, with the extension of the art elsewhere in Asia and thence into Europe, the necessity of finding other substances for this purpose gradually sprang up and, as time went on, became more and more an impressive factor in the development of the industry. The history of paper-making in Europe and in the United States is shot through and through with the records of persistent speculating and experimenting in the endeavor to escape from the limitation imposed upon it by sole dependence upon rags.

Broadly speaking, all fibrous vegetable material, from whatever source derived can be used for making paper. That is not to say that all fibre is really usable. Hundreds of promising experiments have failed and thus demonstrated that a theory, however perfect in itself, does

not always work out well in practice. To what extent it is possible economically to produce, from any particular fibre, good paper, suitable for the needs of the time, is always a debatable question. It is one thing to make one hundred reams as an experiment and quite another thing to make thousands upon thousands of reams that will be continuously marketable. The item of cost is the controlling factor in every instance, but there are minor considerations, such as quantity and quality readily available, adaptability, and so on. A technical success, and a commercial surety, are not necessarily synonymous.

Materials which have been generally considered most suitable for pulp purposes are: raw cotton, fibres of flax jute, hemp, ramie, paper-mulberry and manilla; stems and leaves of straws and grasses such as esparto, corn, sugar cane, bamboo and cotton stalks; various kinds of wood, commonly spruce, hemlock and poplar, although pine, balsam, cottonwood, fir, larch, aspen, cypress, beech, birch, maple, chestnut and other woods are also usable. Beyond these and even within their field, experimenting has gone on extensively and always hopefully despite manifold discouragements and disappointments.

Many lists of substances that have been tried have been made up and often printed. In one, upwards of a hundred different substances were included, some of the most notable of which were: trees of all kinds, alga, aloe, asbestos, asparagus, bagging, bamboo, banana, beet root, blue grass, bran, Brazilian grass, broom corn, burdock, cabbage stumps, cocoanut husks, cotton seed, cotton stalks, corn husks, couch grass, palm, esparto, ferns, flag leaves, flax, floss silk, frog spittle, grape vines, gutta percha, hay, hemp, hollyhock, hop vines, ivory shavings, jute, leather cuttings, leaves, manures, marshmallow, moss, mulberry, mummy cloth, nettles, oakum sacking, peat, plantain, raw cotton, reeds, rice straw, ropes, rushes, sawdust, sea weed, silk, sorghum, straw, thistles, tow, water broom and wool.[200]

[200] Joel Munsell: *A Chronology of Paper and Paper Making*, (1870), p. v.

Some thirty years ago another writer on the subject confessed that "it would be almost an impossibility to enumerate all the materials which have been used for the manufacture of paper." But he presented a list of "those paper-making substances, concerning which he has acquired any information, through diligent research." That list numbered nearly five hundred. In it were all the well-known substances and others not so well known, including some of strange character. Among the many oddities were animal substances, animal excrements, brewery refuse, blackberries, cabbage, cabbage-stumps, cucumbers, dust, frog-spittle, turnips, potatoes, peas, tobacco, water lilies, horseradish, pineapples and raspberries.[201] Lists like this might be extended almost indefinitely, showing how persistent and indeed sometimes recklessly has been the search for a substitute for rags.

Within necessarily limited space one can only hope to range over the field cursorily, touching lightly here and there upon some of the most curious and most illustrative features of the subject of raw materials, and dwelling with something more of preciseness upon those things that have contributed materially to the growth of the industry and become a component part of it.

In May, 1789, J. Hector St. John Crèvacœur presented to the American Philosophical Society of Philadelphia a printed book of which he said, "the leaves of which are made of the roots and barks of different tress [*sic*] and plants, being the first essay of this kind of manufacture." Crèvecœur was a noted Frenchman who came to America before the revolution and was naturalized here in 1764. He settled in New York and engaged in farming and scientific pursuits. He was the author of *Letters from an American Farmer,* describing conditions of American life, published in London in 1782.[208]

Much attention was early given to the subject of paper by the American Philosophical Society of Philadelphia.

[201] Charles T. Davis: *The Manufacture of Paper,* (1886), p. 64.

[208] *Early Proceedings of the American Philosophical Society,* p. 173. In Vol. XXII, *Proceedings of the American Philosophical Society,* (1885).

At a meeting of the society, December 6, 1771, Andrew Oliver presented "a small quantity of American Asbestos, found near Newburg, some prepared in Wick for lamps & some for Writing paper." This recalls the report that an asbestos paper was manufactured in a Pennsylvania mill as early as 1728.[205]

At one time some experimenters expected much from a water plant of slender green filaments similar to what is called frog-spittle. It was observed that fibres of this plant were disintegrated by action of water and rose to the surface as scum where, finally, beaten into pulp, matted together and dried on the shore, they came out as veritable sheets of paper. It has been noted in a preceding chapter that one of the first patentees in the paper-manufacturing field was Chancellor Robert R. Livingston. The patent which Livingston took out was for a new process of paper-making in which he was associated with P. De Labigarre, and out of it a fortune was expected. A letter written from Tivoli, N. Y., September 9, 1799, by De Labigarre to Peter Van Shaack gives some account of the wonderful discovery, which was nothing more than an idea of using this frog-spittle.[206]

Early in the nineteenth century the American Company of Booksellers of New York, Philadelphia and Boston, offered a gold medal valued at fifty dollars for the greatest quantity and best quality of printing paper not less than fifty reams made from other material than rags of linen, cotton or wool, and a silver medal valued at twenty-five dollars for the greatest quantity of good wrapping-paper, not less than forty reams, from new material. There is no record that any claimants for these medals came forward.

Among early United States patents were these for making pulp: from beach grass, Isaac Sanderson, Milton, Mass., 1838; corn husks, Burgiss Allison and John Hawkins, Burlington, New Jersey, 1802; currier's shavings,

[205] *Early Proceedings of the American Philosophical Society*, p. 68. In Vol. XXII, *Proceedings of the American Philosophical Society*, (1885).

[206] *The Historical Magazine*, First Series, III., pp. 20 and 90.

Joseph Condit, Jr., 1801; pelts, John McThorndike, 1814; rags and straw, and corn husks to be mixed with rags, John W. Cooper, Washington township, Penn., 1829; sea grass, Elisha H. Collier, Plymouth, Mass., 1828; sea weed, Samuel Green, New London, Conn., 1809; corn husks, Homer Holland, Westfield, Mass., 1838. Some later United States patents, about the middle of the century, while the age-long efforts to turn wood into pulp were being brought to successful commercial conclusion, were for pulp from reeds, grain, beet and other refuse, ivory shavings, Spanish grass, sorghum, resinous bark, corn stalks, corn cobs, pine shavings and cotton stalks.

Pulp from corn-husks was a favorite diversion of the experimenters back in the eighteenth century, and so continued for a hundred years or more. Four years before Homer Holland took out his patent in 1838, a man in Alabama succeeded in making paper of very good quality from the husks of corn and from various kinds of woods and barks, particularly birch and poplar. But neither this nor other efforts matured. The Holland process seems to have been appropriated and improved upon in Austria about 1860. A new patent was granted in the United States in 1863 to Dr. Alois Ritter Aur Von Welsbach of Vienna and manufacture was commenced in the Clinton mills, Steubenville, N. Y.

A few more instances may be cited not because they are exceptional nor because they comprise the whole of the subject. But they indicate the constant activity that was going on until wood-pulp came in to overwhelm everything else, and the eagerness with which even the slenderest thread of hope was seized upon. Said Hunt's *Merchant's Magazine* in 1841:

> "We now learn that Messrs. E. Thorp & Sons of Barre, Massachusetts, paper-makers, have taken out a patent for the manufacture of several varieties of paper from palm leaf. They make, at present, however, only wrapping paper. The editor of the Barre Gazette has received a few rolls, and pronounces it unusually strong, and at the same time delicate and flexible, presenting a surface smooth and suitable for writing."

In 1860 *The New Orleans Bulletin* stated that it had been shown seven different kinds of material, growing in Louisiana, and specimens of fibre made from eleven different kinds of material also growing in Louisiana. Some of the threads were described as being of a delicate floss-like substance, nearly equal to silk, while others were strong like hemp. It was asserted that paper could be made of various colors, and of any quality from the finest white letter and silk paper to the coarsest wrapping-paper and from materials that were abundant; bagasse, the refuse of sugar cane, cotton stalks, wild indigo and banana.

In 1869 experiments were made in California with tule, a swamp land product, which was said to give a good quality of paper. The scarcity of rags on the Pacific coast affected manufacturing a great deal and the two mills then in California complained that they found it more profitable to make wrapping than printing paper. About the same time a manufacturer of Buffalo, N. Y., came forward with a claim that he could make wrapping-paper better, tougher and cheaper, from wire-grass than from any other material then in use. The grass could be procured from Michigan and cost thirty dollars a ton. The *Portland Advertiser* of Portland, Me., in 1869, tried the experiment of printing on paper made from water-rice, which grew in great quantities in the northwest; and the customary prediction of a paper-making revolution was quickly followed by the customary failure.

Just after the civil war the discovery was made that the reed cane from the southern states, when subjected to the explosive force of steam, could be converted into a long fibre valuable for paper-making. This was sold in the northern states at twenty dollars per ton to be made into wall paper, or, mixed with manilla, into wrapping-paper. The American Fibre Disintegrating Company had a big establishment in Brooklyn, N. Y., where this process was used upon cane and bamboo. The works of the company were burned before it was possible to have the process successfully tried.

Great expectations were based upon peat in the latter part of the nineteenth century. It was plausibly argued

that the quantity of peat in the world is enormous and the fibres derived from it would furnish a substitute for wood for boxboard and wrapping-paper. The low cost of production, less than one-half the cost of straw-board, was an item urged in its favor. An attempt to work the bogs of peat was first made in Ireland and there failed. Another attempt was made in Sweden, without success. In the United States the business was established on a substantial scale by the Pilgrim Paper Company in a mill near Capac, Mich., in 1906. The plant turned out thirty tons of box board every twenty-four hours. Notwithstanding its apparently promising start this "peat to paper" business fell by the wayside after a few years.

As late as 1870 anxiety and speculation over the scarcity of paper-fibre was at such a height that consideration was given to the possibility of producing pulp from animal as well as from vegetable substances. One ingenious experimenter proposed to use fishes which, divested of skin and bones, were placed in a diluted solution of bichloride of mercury and alum until the fibres were separated. It was claimed that when twenty per cent of this pulp was employed with rag the paper could be distinguished from the ordinary article only by its being stronger and tougher. It is perhaps needless to say that this fish-paper did not become a commercial commodity. Even more weird was the remarkable discovery of a man of Long Island, N. Y., nearly fifty years after the fish proposition. The idea was sufficiently told, without elaboration of detail, by an editorial commentator who thus disposed of it:

> "According to the Brooklyn *Eagle,* a druggist on Long Island has rescued the contents of his wife's garbage pail from the grasp of the collector, and using it as a competitor of easy bleaching sulphite, has begun his career as a paper manufacturer. The discoverer declines to say just what he does to the contents of the pail, except that he treats it chemically, presumably putting chloride of lime at the head of the list of the chemicals to be used. He likewise says that the present equipment of paper mills can be used and that his experiments demonstrate that he can make paper out of the new, yet old material. That

> fact will prove 'an epoch in the history of paper making.'
>
> "Probably it will, and when it does the full dinner pail and the full garbage pail will go down into history as the 'Gold Dust Twins' of the paper industry. The druggist may have discovered a method of turning garbage into No. 1 ledger, or superfine writing, or bond the equal of Cranes'. We hope he has, but we await the arrival of convincing evidence on the point, feeling, meantime, that it will be some time before 'Swell Swill Bond' will be an article to be found in the stock of the leading paper distributors of the country."[207]

The foregoing may well conclude a review that has been desultory rather than exhaustive and that has pointed only to the fact that most of the search for pulp-material has been utterly futile while much has been ill-considered or even fantastic. When all else has been disposed of we come finally to four great staples, rags, straw, wood and jute. And the greatest of these once was rags and now is wood. Esparto would be included if this was a history of paper-manufacturing in England, but its use in the United States has always been negligible. Until well after the middle of the nineteenth century the history of paper, the world over, at least in Europe and on the western continent, was, in one sense, a history of rag-gathering, for no other materials were to any great extent available. In the United States rags and rags only were the fundamentals in all paper-making for more than a century and a quarter, when straw first came in and wood long after. During most of this period the mills depended almost entirely upon the domestic supply and their often desperate conditions by reason of the dearth of rags has been described in other chapters of this work. Not before 1800 did the United States draw much in the way of rags from Europe and at the end of the first decade of the century importations were still slight. Then a change began to set in. A veteran paper-manufacturer of that period has described the situation that then existed:

[207] *The Paper Trade Journal*, August 24, 1916, p. 34.

> "About the year 1810 we began to experience a deficiency of raw material (rags) and were obliged to resort to Europe for supplies. At present [1850] we have an additional inducement to import our material. The article of cotton has here almost entirely superseded the use of linen for wearing apparel and when much worn and reduced to rags becomes a very tender substance; in fact, scarcely able to support its weight when made into paper. The foreign rags, we suppose average about 80 per cent of linen, which when mixed with the domestic cotton imparts to the paper a strength and firmness which it could not have without it. The best qualities of writing and printing papers contain from 30 to 50 per cent of linen, for which we are entirely depending on foreign countries. But as the use of cotton for clothing is yearly increasing all over the civilized world, we find the proportion of linen in imported rags decreasing from 5 to 10 per cent from year to year. We have an excellent substitute for this in our own country, did not its high price prevent its use—raw cotton—which makes a beautiful paper when mixed with the worn out rags of the same material. In 1837-38 when the price was as low as 6 cents per pound, large quantities were manufactured into paper."[208]

In 1818 the value of rags annually gathered in the United States was estimated at $900,000 and the annual importations were less than $100,000. In 1829 it was estimated that the quantity of rags and other paper stock annually saved amounted in value to $2,000,000 and in 1832 the mills of the country paid for rags $3,500,000, about one-half their total cost of manufacturing.

Statistics of the value of rags imported into the United States prior to 1825 are not available. In the annual reports of the secretary of the treasury rags were not separately listed but were classed with "all other articles," as the smaller imports were grouped. In 1825 rag importations amounted in value to $79,639; in 1826, $122,624; in 1827, $128,949; in 1828, $279,041. With slight fallings off in 1829 and 1831 and a drop to $72,661 in 1830, they mounted to $466,387 in 1832, to $707,011 in 1836, dropped

[208] James M. Wilcox: In *Report of the Commissioner of Patents for the year* 1850, (1851), p. 404.

to $439,229 in 1837, and then, except with fallings to $79,853 in 1843, to $295,586 in 1844 and to $304,216 in 1847, went up quite regularly, year by year, with slight fluctuations to the amount of $903,747 in 1851. In 1854 the million dollar mark was passed, the import figures for that year being $1,010,443. The imports in pounds, in 1843 were 2,106,751; in 1844, 7,301,738; in 1845, 10,903,-101; in 1846, 9,877,706; in 1848, 17,014,587, at an average price of 3.68 cents per pound; in 1849, $14,941,236; in 1850, 20,696,875, at an average price of 3.61 cents per pound. The imports were from thirty countries, but more than two-thirds from Italy alone.

Manilla, jute and other materials were imported in small quantities in the earlier years of this century but records were not separately kept until 1843. In 1843 the imports of manilla were to the value of $42,149, jute, $37,-164, tow, $81,913, flax, $15,193; in 1844, manilla, $209,385, jute, $28,692, tow, $15,763, flax, $67,738; in 1845, manilla, $457,276, jute, $92,507, tow, no figures given, flax, $16,-337; in 1850, manilla, $659,362, jute, $192,816, tow, $32,421, flax, $128,917. The gross totals show an increase from $176,419 in 1843 to $1,013,516 in 1850.[209]

Lyman Hollingsworth of South Braintree, Mass., one of the founders of the Hollingsworth & Whitney Company, discovered that manilla rope could be successfully used as stock. After the panic of 1837 several years of business depression followed and, as Mr. Hollingsworth afterward told the story, he found himself not only without stock but also without money with which to buy it. From the hemp sails or canvas that he had been using in his mill he had cut the manilla bolt ropes and thrown them aside in a pile of refuse, as of no value. In the emergency he thought to experiment with these ropes. Cutting them up with axes, he worked some of the material into pulp and then into paper, surprising even himself by finding that he had produced a fine, strong manilla sheet. He took out a patent for his discovery, the patent, No. 3362, being granted, December 4, 1843, to John M. Hollingsworth and

[209] *Reports of the United States Treasury on Commerce and Navigation.*

Lyman Hollingsworth, copartners under the firm name of J. M. & L. Hollingsworth. It was immediately after this, 1845-1850, that the importation of manilla and like substances began to assume prominence.

Straw was the first new material that was brought to supplement rags, to any substantial extent. Experiments with straw had long been made in Europe and in the United States before a practical method of using it was discovered by a Pennsylvania man.

William Magaw of Meadville, Penn., was engaged in the manufacture of potash in 1827 and after. The hoppers that were used were lined with long straw before the ashes were introduced and Magaw, in handling the straw, discovered that by macerating it he could produce a substance that was very like the rag pulp out of which ordinary wrapping-paper was made. On this idea he secured a patent, March 8, and May 22, 1828, and at once began manufacturing in a small way. The paper that he made was of a faint yellow color but strong and durable and after it came to be machine-made was sold for less than two dollars per ream imperial size. It has been said that an edition of the New Testament was printed on it at a cost of only five cents a copy and in 1829 it was used for several issues of *Niles' Weekly Register*. The story is told—and you may believe it or not as you choose—that, in November, 1829, at Meadville, a canal boat was launched that was built of materials that had been growing on the banks of French creek twenty-four hours before and that two days later it started down the creek and the Allegheny river for Pittsburg, ninety miles away, with twenty passengers aboard and three hundred reams of straw paper.[210]

GEORGE A. SHRYOCK.

One of the first with whom Magaw consulted regarding his discovery and his idea of adapting the

[210] *The Crawford Messenger.* In Sherman Day: *Historical Collections of the State of Pennsylvania,* pp. 256, 258.

straw-pulp to the manufacture of paper was George A. Shryock who was then operating the Hollywell mill near Chambersburg, Penn. In the summer of 1829 experiments were conducted in the Hollywell mill and proved eminently successful. For several weeks the work went on, seven hundred to one thousand pounds of straw being boiled at one time and paper made at from twenty to thirty reams per day.

Samples of the new paper were sent to John Jay Smith who was librarian of the Philadelphia Public Library and also editor of *The Philadelphia Bulletin*. Samples were sent to other persons in different parts of the United States and in Europe. Part of one issue of the *Bulletin* was printed on straw paper and a small lot made into wall-paper by a Philadelphia manufacturer.

Shryock was so impressed with the results of these experiments that he abandoned the manufacture of paper from rags and for several months devoted his mill entirely to the manufacture of paper from straw. He introduced a small cylinder machine and always after claimed that "this was the first machine ever operated on that material." Within a year he invented the grooved wood roll for the manufacture of binders-boards and box boards. At that time he had set up a steam boiler of fifteen horse power in which to cook the straw and was making from one hundred and fifty to two hundred reams of crown wrapping-paper every twenty-four hours. His discovery of the availability of straw for binders-board encouraged him to extend his operations. He built a new mill-dam, widened the head-race, built a new drying-house, constructed additions to the old mill, put in four pulp engines, fitted more rooms for drying, and added a new steam house with tubs; all this at an expenditure of about $35,000.

In association with Nicholas G. Ridgley of Baltimore Shryock purchased, from Magaw for $26,000, the exclusive right to the straw-pulp process for all the eastern part of the United States, and plans were made to increase the capacity of the Hollywell mill and to erect other mills in Rochester, N. Y., Paterson, N. J., Old Chester, Penn., and Chambersburg Penn. The sudden death of Ridgley

upset these plans and in 1831 a new firm was organized, composed of Shryock, S. D. Culbertson, Reade Washington and Alexander Calhoun. This concern, known as G. A. Shryock & Co., built a mill on the Conococheague creek near Chambersburg. The mill building was one hundred and fifty by fifty feet and five stories high, had one hundred and two miles of drying poles, seventeen large dry presses, eight pulp engines and eight machines easily making one hundred pounds per hour. A big establishment for that time and locally known as "The Mammoth," it stood for more than thirty years, being destroyed when Chambersburg was burned in July 1864 by raiding confederate troops under General J. A. McCausland; and it was not rebuilt.

Relating the story of his early efforts with straw Mr. Shryock once said:

> "It is not difficult to tell the origin and progress of the manufacture of straw paper and boards, but who can tell the toil, labor, anxiety and mental agony endured for the first four or five years? . . . In my life of experiments I made paper of every description from straw—wheat, rye, barley, oats and buckwheat—corn-blade, all the grasses, corn-husks, white-pine shavings, willow wood, refuse tan, also bleached straw, to resemble printing paper. But as rags could then be bought from two and one-half to four and one-half cents per pound, it would not pay to bleach straw."[211]

In 1853 Jean T. Coupier and Marie A. C. Mellier showed, in the New York Crystal Palace exhibition, specimens of paper made from straw, by a process which they had patented in France and in the United States. Feinour & Nixon of Philadelphia introduced the process into their mills on the site where the Nixon Flat Rock mills were later located. Then they were supplying the *Public Ledger* of Philadelphia with paper and the owners of that periodical, impressed by the scarcity of rags for pulp purposes, encouraged the experiment with straw by trying to use the new kind of paper from that material. But their good

[211] *The Franklin Repository*, Chambersburg, Penn., May 2, 1866.

intentions did not meet with success as the story has been told with humorous exaggeration by one who knew. It is a good story and may be at least accepted as enlivening the otherwise dullness of veracious history.

> "The subscribers to the *Ledger* in many cases returned their papers with the inquiry lead-penciled on the margin, as to why the owners did not use wrapping paper. Complaints were made from a section of the city in which the *Ledger* was served, and in which a large number of goats were kept, that the subscribers failed to receive their papers. Knowing that papers had been served a watch was set to catch the thief, when it was discovered that the goats, attracted by the yellow color and thinking it was straw, ate the papers. The mortality in goats in that section increased greatly, due to the bad quality of printers' ink used in those days and the improper preparation of the pulp which was not boiled."[212]

For many years the Magaw process practically had the field to itself. As time went on, however, new methods of treating straw were devised and improvements made. Palmer & Howland of Fort Edward, N. Y., in 1859, devised modifications in apparatus and in treatment. In 1860 Eber Clemo of Toronto took out patents for making pulp from straw or grass by treatment with nitric acid and an alkaline solution. Tait & Holbrooke of Jersey City and New York, in 1863, came out with a plan for cutting and grinding straw between burr-stones and then treating it chemically. And others were studying the problem.

Eventually the Nixons introduced many improvements upon the French process and in the closing years of the century the Flat Rock mills were making 2,600,000 pounds of straw paper annually or about ninety-three thousand reams newspaper size, worth about $450,000. Six hundred tons of rags were used, three thousand tons of straw, five hundred tons of soda ash, four hundred tons of bleaching powder and two thousand tons of coal.[213]

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[212]William H. Nixon in *The Paper Trade Journal*, October 16, 1897, p. 59.

[213]*The Pennsylvania Magazine of History and Biography*, Vol. XX, p. 330.

Paper from wood was a reality, from time immemorial. Passing by the Chinese usage of the mulberry and other trees, paper-makers in Europe never ceased trying to extract the fibres from all kinds of trees but without material or enduring success until well into the middle of the nineteenth century. Concerning nearly every experimenter, it is impressively declared that the idea was suggested to him from observation of the fibre of wasp's nests. Réaumur the French scientist, in an essay in 1719, pointed out this and, although it was claimed that he was the first, it is quite likely that others had anticipated him in this observation and conclusion. He had numerous followers down to Keller. But for more than a hundred years after Réaumur the wasps continued to succeed while their more ambitious human imitators were conspicuously failing.

In the United States, Matthew Lyon of Fairhaven, Vt., made a fair quality of paper from the bark of the basswood and there were others in the field in his time and later. Lewis Wooster and Joseph E. Holmes, of Meadville, Penn., got out a patent in 1830 for making pulp from wood. They used lime and aspen trees and their process, which was chemical, required one hundred pounds of wood for five to seven reams of paper. An edition of *Crawford's Messenger* was printed on this paper. A few years later William Magaw of Meadville, contested the Wooster-Holmes patent which was decided to be an infringement and work under it ceased. In 1834 Daniel Stebbins of Northampton Mass., tried the bark and foliage of the mulberry tree. He had a nursery of trees which he had raised from seeds imported from China. This was when the craze for cultivating the silk worm had spread all over the eastern part of the United States, and mulberry plantations were to be as common as apple orchards. But the silk-culture experiment failed and so also did that of pulp from the mulberry, although a few reams of excellent writing paper were produced.

In 1855 George W. Beardslee in a mill in Little Falls, N. Y., attempted to make pulp from basswood but his experiment was not successful. In 1863 an edition of *The Boston Journal* was printed on paper made from basswood

but nothing came from this, although it was said that "the paper presents a clear surface, is of soft, firm texture and admirably adapted for newspaper purposes."

Milton D. Whipple of Charlestown, Mass in 1855 patented a method of preparing wood for pulp by grinding wooden blocks on a stone and, in the same year, Louis Koch of New York devised machinery for separating the fibres without destroying them, by means of a series of rollers. An improvement in the treatment of stuff by chemical process was the subject of a patent by Julius A. Roth in 1857. Charles Marzoni of New York, in 1858, took out a patent for reducing wood to pulp by mechanical means, using an "adamantine" stone with steam and hot water and in the same year Henry Voelter patented his method of using a rotary grinder or millstone for abrasing the wood. In 1863 several patents in this field were taken out. Stephen M. Allen of Woburn, Mass., patented a process of crushing the logs of wood longitudinally to preserve the integrity of the fibres which were then boiled, ground and bleached. Professor Chadbourne of Williams College came out with a process which combined chemical and mechanical principles and which was expected to reduce the cost of pulp to one half. George E. Sellers of Hardin County, Ill., grandson of Nathan Sellers the noted maker of paper-moulds in the period of the revolution, took out a patent for preparing fibre by vertical pressure.

Several years of seemingly fruitless experimenting, principally in the town of Reading England, preceded the final success of Hugh Burgess and his partner Charles Watt in making pulp from wood by chemical process. In 1851 they were at last able to show good pulp by their method and from this, white paper, suitable for printing, was made in a paper-mill in Boxmoor, Hertfordshire, England. Part of a weekly issue of *The London Journal* was printed from this paper and it passed the test full well. The Burgess invention, simply stated, was the producing "of a good pulp by boiling wood in caustic alkali at a high temperature" with the substitution or addition, in some instances, of chlorine or the hypochlorites for the caustic alkali. At that time paper for printing commanded £40

a ton in London, made, of course, entirely from rags, and it was hoped that the price could be reduced nearly one-half if pulp from wood could be had.

The process was patented in England in 1852, but the new pulp did not meet with prompt acceptance there. Disappointed, Burgess came to the United States with his invention in 1854 and secured a patent here, in that year. In this country he joined with Morris L. Keen of West

HUGH BURGESS.

Philadelphia who had been working upon a mechanical process of deriving pulp from wood. Burgess and Keen conducted further experiments in an old engine-house of the Wilmington & Philadelphia Railroad, at Gray's Ferry, on the Schuylkill river, near Philadelphia, where Keen also had a lumber wharf. The experimenting period lasted

several months and during that time various raw materials were tried, wood, straw, corn-stalks, bamboo and cane, none being found as suitable as wood. The first pulp was made into paper in the Warren mill of Maylandville, near the pulp-mill, and also by Megargee Brothers and J. Howard Lewis. Larger mills were built at Royers' Ford on the Schuylkill, the following year and for nearly forty years work was carried on there with Burgess as manager.

Prejudice against the new pulp was not easy to overcome. For a long time many manufacturers held stubbornly to the opinion that, while wood-pulp might be a good filler, it was not a good fibre. Gradually, however, soda-pulp won its place into acceptance. Jessup & Moore and Matin Nixon became early and large users of it and others followed them. For a long time there were sceptics. One critic wrote thus scornfully of the process:

> "The great bamboo enterprise was thrown into the shade by another which was organized for the production of paper from poplar, and located at Manayunk, on the Schuylkill river. It had been discovered that poplar could be manufactured into paper in twenty-four hours, and with so much economy that it could be sold so as to afford a profit at ten cents a pound! Works were accordingly constructed of stone and brick [the Jessup & Moore mill] in the most substantial manner occupying a space 1,000 feet long by 350 feet wide, at a cost of over $500,000. United with the Flat Rock mills [Feinour & Nixon] they were represented to embrace an area of about ten acres; and were thought to be the most extensive works of the kind in the world, and to be capable of producing from ten to fifteen tons of pulp a day. It was announced in the newspapers, which always exercise an unbounded liberality in figures in such cases, that the subscribed capital in this enterprise was upwards of ten millions of dollars. The grandest calculations were indulged in the abundant supply of poplar, with the aid of willow and other soft woods, nearly valueless for fuel; and were to result in as great a boon to civilization as the steam engine and the magnetic telegraph."[214]

[214] Joel Munsell: *Chronology of Paper and Paper Making*, (1876), 199.

Mill of the American Wood Paper Company, Royer's Ford.

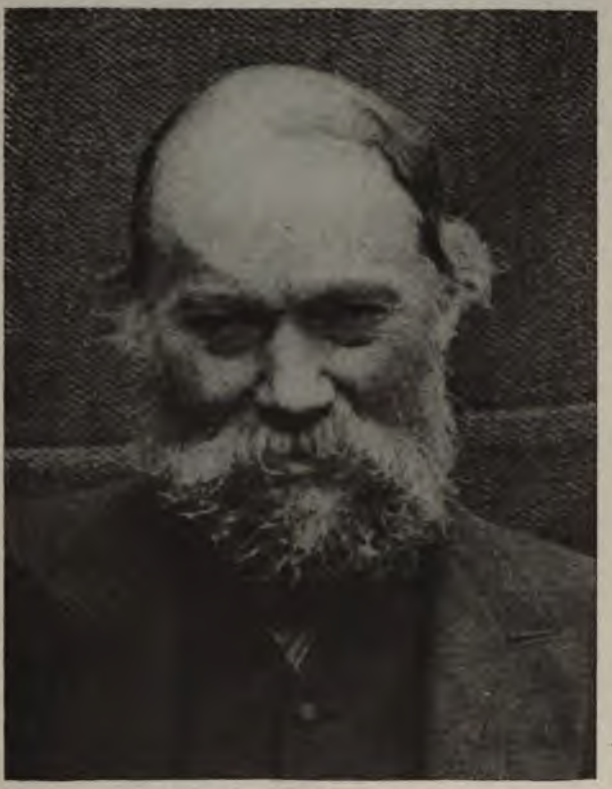
In 1863 the business was organized as the American Wood Paper Company, incorporated with a capital of two million dollars. Works on a big scale were erected at Manayunk, where twenty tons of wood pulp were daily made, while in the Royer's Ford plant nine tons a day were turned out. Litigation, as usual, sprang up, but for years the company was able to hold its position as the leading manufacturer of soda-pulp and paper. In this period Effingham Embree was active in the management. Before the close of the century the company failed and the Manayunk plant became the property of the Philadelphia Manufacturing Company and was refitted as a paper-mill. Before that time the manufacture of soda-pulp had been established in other parts of the country. Principally, however, it remained in Pennsylvania where, into the next century, were a third of the soda-pulp mills. Compared with sulphite and ground-wood, soda-pulp has not made a large showing in number of mills or amount of product.[215]

Like many another inventor and discoverer Benjamin C. Tilghman succeeded and failed; succeeded in discovering something new and practical in an industrial field, and failed to profit from his discovery. In Philadelphia, shortly after the close of the civil war, he experimented with a solution of sulphurous acid to dissolve the intercellular matter of wood, leaving the fibres to be turned into a pulp suitable for the making of paper. The result was successful, as to the product finally secured, but an entirely satisfactory method of operation had not been found when Mr. Tilghman, after having spent much time and money, ceased his efforts and went to work in another field.

After Tilghman had abandoned his sulphite experiments Fry and Ekman in Sweden, about 1870, carried investigation further and the improved Ekman process came into practical use, first secretly, until about 1879, and then more openly in England and finally in a large mill near London in 1884. The first American paper-maker to take

[215] J. Smith Futhey and Gilbert Cope: *History of Chester County, Pennsylvania,* (1881), p. 492. *The Paper Trade Journal,* October 16, 1897, pp. 59 and 140. *Lockwood's Directory of the Paper and Stationery Trades,* (1915).

up the process and operate on a commercial scale in this country was Charles S. Wheelwright of Providence, R. I. In 1882 he saw the working of the Ekman process in a small mill in Bergvik, Sweden. Although, as there shown, the process was evidently imperfect on the mechanical side, the high grade of the product encouraged Mr. Wheelwright and his associates to erect, on a large scale, the



BENJAMIN C. TILGHMAN.
Inventor of the Sulphite Pulp Process.

plant of the Richmond Paper Company at Greenwood Point, East Providence. Pulp of high quality was made but the mechanical difficulties in the way of practical working were so great that the manufacturers soon found themselves seriously embarrassed. Various forms of digesters were designed by Mr. Wheelwright to over-

come defects in the apparatus. He took out patents in 1884 and 1886 and was able to reduce the cost of repairs on linings very considerably.

Throughout all this period of difficulty the product of the mill was equal, if not superior, to any other in the United States or abroad, at that time and immediately

GEORGE N. FLETCHER.

thereafter. Nevertheless the process could not then be made commercially profitable and Mr. Wheelwright was forced to give it up. The Richmond mill had two Fourdrinier machines and ran on book and news, producing fifteen tons a day. In 1887 the company failed with liabilities of $600,000.[215½]

[215 1/2] R. B. Griffin and A. D. Little: *The Chemistry of Paper-Making*, (1894), p. 185-7.

THE ALPENA MILL.

In after years the Mitscherlich patents for the production of sulphite-pulp were brought from Europe to the United States by August Thilmany who had bought the American rights. The International Sulphite Fibre and Paper Company was formed to purchase the American and Canadian rights and to enter upon the manufacture. Under the supervision of Thilmany a mill was built in Alpena, Mich., by George N. Fletcher and Albert Pack, two lumbermen who were primarily interested because they wished to find some way of utilizing the refuse from their lumber-mills. When completed the plant cost a little over two hundred thousand dollars and, in the essential parts of its equipment, specifications and details submitted by Mitscherlich were carefully followed. The process was very slow then, from sixty to seventy-two hours being consumed in charging, cooking, and emptying a digester which had been built to contain about twenty-five cords of wood. Within a decade improvements had been made in the process so that cooking was done in from ten to sixteen hours and ten tons of pulp a day from one digester was not uncommon. In the beginning sulphite sold at four and one-half cents a pound and by the end of the century it was produced for a cent a pound. Mr. Pack did not long continue in the business which was carried on alone by Mr. Fletcher until his death and afterward, until the present time, 1916, by his sons, though ground-wood in later years there shared honors with sulphite. Eventually Michigan lost its preeminence in this branch of pulp-making, Maine, New York and Wisconsin, where wood was most abundant, having a majority of the mills.

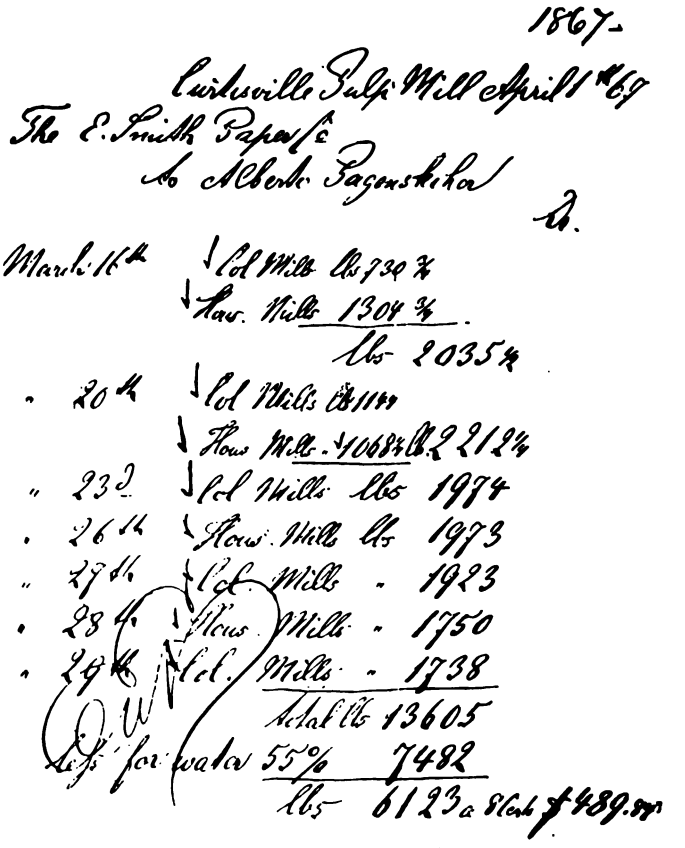
It has been a tale oft-told that Friedrich Gottlob Keller discovered from a deserted wasp's nest how small fibres of wood were matted into a coarse paper substance and how, at his suggestion, Henry Voelter, a paper-maker and a practical machinist, constructed a machine and invented a process for grinding wood into pulp. At the World's Exposition in London in 1867, and at the Paris Exhibition in 1867 full working plants of the Keller-Voelter process were displayed but they attracted little attention, although it was shown that mills in Germany were

already producing a good quality of ground-wood pulp. Not many years elapsed before the process was brought to the United States. The Pagenstechers, Albrecht, Alberto and Rudolph, acquainting themselves with the work that had been done abroad, imported two of the new pulp-grinding machines in 1866. They erected a building on a water-power in Curtisville near Stockbridge, Mass., and there made wood-pulp, in March 1867. The first lot of

ALBRECHT PAGENSTECHER.

pulp was tried in the near-by mill of the Smith Paper Company, under the direction of Wellington Smith, and the experiment was so satisfactory that the company contracted to use all that the Curtisville mill could turn out; for a year it had a monopoly of the new material. In 1869 the Pagenstechers bought the Voelter patent for this country and by extensions the life of the patent was continued until 1884 when it expired.

At the outset about half a ton a day was the capacity of the little mill in Curtisville. The pulp was formed into cakes by hand presses and shipped to consumers in barrels. In the Luzerne mill a method of running the pulp over a wet machine was adopted and thenceforth it was thus


1867-
Curtisville Pulp Mill April 1st 67
The E. Smith Paper Co
To Alberto Pagenstecher
Dr.
March 16th Col Mills lbs 730 3/4
Hous. Mills 1304 3/4
lbs 2035 1/2
" 20th Col Mills lbs 1144
Hous Mills 1068 1/2 lbs 2212 1/2
" 23d Col Mills lbs 1974
" 26th Hous. Mills lbs 1973
" 27th Col. Mills " 1923
" 28th Hous. Mills " 1750
" 29th Col. Mills " 1738
Total lbs 13605
Less for water 55% 7482
lbs 6123 a 8 Cents $489.84

FIRST BILL FOR AMERICAN WOOD PULP.

put upon the market. Ground-wood pulp was first sold at eight cents a pound but soon dropped to five and four cents and eventually to one cent. It was a prime factor in bringing the price of news-paper from fourteen cents in 1869 to two cents before 1900.[216]

[216] A. Pagenstecher: *The Paper Trade Journal*, October 16, 1897, p. 19.

CURTISVILLE WOOD-PULP MILL.

In 1868 and 1869 several persons were interested in the process and small pulp-mills were built in Lawrence, Fitchburg and Lee, Mass.; Norway, Me., Lanesville, Conn., and Luzerne, N. Y. The mill in Luzerne was the first to be equipped with machinery made in America and it was the beginning of the Hudson River Pulp and Paper Company. None of these early mills was a financial success. William A. Russell of Lawrence became acquainted with the work of the mill in that place and, buying rights for the New England states, built two mills, one in Franklin, N. H., and one in Bellows Falls, Vt. About the same time Warner Miller took a large interest in the Pagenstecher enterprise and the construction of the big mill at Palmer's Falls, N. Y., was begun. Mr. Miller's enthusiasm and energy in developing the business were untiring. He was particularly successful in combatting attempted infringements upon the patent, which were many, and in securing for ground-wood favorable tariff legislation, his activities winning for him the soubriquet "Wood-Pulp Miller."

Another pioneer was Alvah Crocker of Fitchburg, Mass., who, in connection with his plans of developing Turner's Falls, Mass., into a great mill center, built there the pulp-mill of the Turner's Falls Pulp Company, later merged into the Montague Paper Company. In this mill poplar was used exclusively, one cord of wood producing about one thousand two hundred pounds of pulp. From fifty to sixty hands were employed and the output of the mill was from five to seven tons a day.

Thus was the beginning here of the great pulp-process that has, in less than a half century, completely revolutionized the making of paper the world over and has rendered nugatory all efforts to utilize pulp material from other sources. Very soon ground-wood pulp dominated the field. Eventually straw for printing-paper was abandoned, but was continued for boards. Soda pulp fell into a minor position but sulphite pulp remained as a considerable factor, though proportionately small as compared with ground-wood, its superiority for book-paper having been established.

[illegible]

[illegible]

[illegible]

A[illegible] multi- plicity [illegible]

When the [illegible] census of the United States was taken in [illegible] a really serious attempt was made to gather more comprehensive statistics than before in regard to the manufacturing and other industries of the country. The result, however, scarcely answered to the success that was planned at the outset, [illegible] it was better than any-

thing of the kind that had, up to that time, been accomplished. No establishment was included that did not have an annual production value of at least five hundred dollars. Two digests of the statistics that were gathered were made; one, in 1853, under the direction of J. D. B. De Bow, superintendent of the census, and one, in 1858, by his successor, Jos. C. G. Kennedy. Both were manifestly imperfect and inaccurate, and exhibited only in a broad way industrial conditions then prevailing in the country.

The statistical view, prepared by J. D. B. De Bow,[217] confined itself almost wholly to population, education, churches, libraries, agriculture, and occupations of males. So faulty was it that in many parts the exact facts cannot be got at, nor reliable conclusions be derived from it. Also, in many of its figures, it is not in agreement with the later abstract made by Jos. C. G. Kennedy. But, taking the figures as presented, there were, in 1850, in the United States, 123,025 manufacturing establishments, with a capital of $533,245,351, using raw material to the value of $555,123,822, employing 731,137 males and 225,922 females and producing annually to value of $1,019,106.16.

Paper was not yet a considerable proportion of the entire manufacturing of the country. There were four hundred and forty-three mills, with a capital of $7,260,864, using raw material to the value of $5,555,929, employing three thousand eight hundred and thirty-five male and two thousand nine hundred and fifty female hands and producing annually to the value of $10,187,177. This was an insignificant part of the whole, but it showed a slight increase in the number of mills, since 1840—about four per cent.; a substantial increase of more than fifty per cent. in the capital invested; a decrease in the number of male employees, but an increase in the total number of employees, and an increased product of about eighty per cent. The males employed, over fifteen years of age, were less than three thousand. On one page of the report the number is given as two thousand nine hundred and seventy-one and

[217] J. D. B. DeBow: *The Seventh Census of the United States, 1850, (1853), pp. lxxiv and lxxix.*

on another page as two thousand three hundred and seventy-nine. Nor did these figures in the report of 1859 agree with the abstract made in 1858. In the former no workers were reported in Arkansas, California, Florida, Iowa, Louisiana, Georgia, Mississippi, Missouri, Texas, Minnesota, New Mexico, Oregon and Utah, and only two in the District of Columbia. In the abstract made five years later two mills were reported in Georgia, but no workers in the District of Columbia.

The abstract made by Jos. C. G. Kennedy was transmitted to the senate by President Buchanan, January 21, 1859.[218] In this it appeared that of the 443 mills reported, New York had 106; Massachusetts, 77; Pennsylvania, 61; Connecticut, 43; New Jersey, 32; Maryland and Ohio, 15 each and New Hampshire and Vermont, 15 each. Massachusetts had the largest product, in value, $2,601,628, followed by Connecticut with $7,226,685, New York with $1,634,579, Pennsylvania with $1,036,655, New Jersey with $888,475 and Ohio with $701,036.

In Massachusetts the business increased tremendously between 1850 and 1855. A census of the latter year, taken by the secretary of state, showed: number of mills, one hundred and twenty-one; capital engaged, $2,564,500; value of product, $4,141,847; persons employed, 2,630.

Throughout this period Berkshire county continued to hold its position as the section of the state foremost in the number of its paper-mills and the amount and value of products. Mills were in Lee, New Marlboro, Housatonic, Sandisfield, Sheffield, Otis, Hinsdale, Glendale in Stockbridge, Tyringham, Adams, Pittsfield and Dalton. Many of these dropped out of existence and gradually, as time went on, the business here was concentrated in Lee, South Lee, Glendale, Housatonic, Mill River, Dalton and Adams.

The Smith Paper Company, which became one of the big concerns of this region, was developed in the middle of this century. Elizur Smith, who was born in 1812, came

[218] *Thirty-fifth Congress. Second Session, Senate Executive Document* 39, p. 90.

into the business of paper-manufacturing in 1834 when he bought an interest in Ingersoll & Platner's Turkey Mill in Tyringham. In the following year he became the junior partner of George W. Platner, the firm of Platner & Smith, thus organized, being one of the leading con-

ELIZUR SMITH.

cerns in Berkshire for the next generation. The firm owned and operated the Aetna, the Turkey, the Union, the Enterprise, afterward known as the Eagle; the Housatonic, the Castle and the Laurel. Mr. Platner also built a mill in Ancram, N. Y., and Mr. Smith, with his brother, bought a mill in Russell, Mass. Mr. Platner died in 1856, and for several years Mr. Smith continued the business under the old firm name. At one time the concern was

the largest producer of writing paper in the United States, or perhaps in the world. It has been said on good authority that when the public demand for French or English paper was at its height, on account of supposed superiority, the Platner & Smith writing, under their own imprint, was considered to be the best "imported" paper of the kind in the market. In 1864 Elizur Smith took his nephews, Wellington and De Witt S. Smith, into the business and organized the Smith Paper Company. Ultimately the company owned every water privilege on the Housatonic river between Lee and Pittsfield, made their own wood-pulp and produced weekly from one hundred to one hundred and thirty-nine tons of book, news and manilla wrapping.[219]

A half century had passed since Zenas Crane built his first mill in Dalton, and he had been a witness and a great part of the wonderful development of this paper-manufacturing region. Before his death, in 1845, he had transferred the Old Red Mill and its business to his sons, Zenas Marshall and James Brewer Crane. The mill was burned in 1870, and its successor took the name of the Pioneer Mill. An old tannery, that had been in existence in Pittsfield near Dalton for fifty years, was converted to paper-making in 1848. It was operated by Wilson, Osborn & Gibbs and then by Thomas Colt, and became known as the Coltsville Mill. In 1862 the building, dilapidated and weather-worn, was replaced by what was then considered to be a very imposing structure, one hundred feet by fifty, where fifteen men and thirty women were employed and three hundred and fifty tons of rags annually used. The Cranes of Dalton purchased the property in 1879 and thenceforth devoted it to the manufacture of paper for the United States government, being popularly known as the Government Mill. Its product of twenty tons a day contrasted strikingly with its earlier capacity.

Another Crane property of about 1850 was the Bay State Mill, operated first by Seymour Crane and James

[219] Byron Weston: *History of Paper Making in Berkshire County, Massachusetts.* In *Collections of the Berkshrie Historical and Scientific Society,* (1895), II., p. 11.

Wilson and, after 1865, by Zenas Crane, Jr. When this mill was burned in 1877 a new structure was erected, owned and operated by the brothers, Zenas Crane and Winthrop Murray Crane. Another son of the pioneer Zenas Crane, Lindley Murray Crane, established a mill in Ballston Spa, N. Y., and two other grandsons, Robert B. and James H. Crane, built paper mills in Westfield, Mass. The Old Berkshire Mill, the first in Dalton, had long before passed from the ownership of its founder, Zenas Crane, into the possession of David Carson and his sons, Thomas G. and William W. Carson. In 1867 it was sold to Charles O. Brown of Dalton, George T. Plunkett of Hinsdale and Lewis J. Powers of Springfield. The mill was burned in 1872, but was immediately rebuilt. In the latter part of the century it was owned by a stock company whose members were Charles O. Brown, William W. Carson, Zenas Crane, Jr., and John D. Carson, a grandson of David Carson. Later it came back into the possession of the descendants of its founder, its owners in 1916 being Zenas and Winthrop Murray Crane.

Byron Weston entered the field of paper-manufacturing in Dalton in 1863, although he had acquired plenty of experience with the business before that time. Born in 1832, he worked in clerical capacity and in the practical making of paper in mills in Saugerties and Ballston Spa, N. Y., in Hartford Conn., and in Lee, Mass. In 1863 he bought the Defiance Mill, which was built by David Carson in 1824 and rebuilt by the Chamberlains after it was burned in 1852. The mill was enlarged and improved by its new owner and for years it was run on linen record and ledger. In 1876 Mr. Weston added to his property by buying the site on which a mill had been built by A. S. Chamberlain in 1855 and afterward owned by William F. Bartlett and Walter Cutting until it was burned in 1875. There he erected the Centennial Mill, and with the two mills developed the large business thenceforth known under his name.

Holyoke, Mass., as "the paper city," did not come into existence until 1853, long after its neighbors in Berkshire county were firmly established in paper-making.

Water-power from the Connecticut river, by means of dams and canals, was developed after 1847, and then began the making of the city into a great manufacturing center.

Joseph C. Parsons started the business in Holyoke with the Parsons Paper Company, of which he was the treasurer and agent, the other principal stockholders being

Byron Weston.

Chester W. Chapin, Whiting Street, Aaron Bagg, Lucy Bagg, Cyrus Fink and Broughton Alvord. Mr. Parsons was the practical man in the enterprise and the only one who possessed experience in paper-making, having been manager of the Ames mills in Northampton and South Hadley Falls, in 1840-43, and for six years part owner and manager of the mill of the Eagle Paper Company in Suf-

field, Conn. He maintained his direction of the Parsons Paper Company until his death and was also interested in other paper-mills. Aaron Bagg was president of the company. Two years after the first mill was built a second was erected and later on the Parsons Paper Company No. 2 was organized and another mill built, this being devoted to bond, ledger, bristol and linens. The name of the corporation and the business has been continued to the present time, 1916, by the sons of Aaron Bagg.

The second paper-manufacturing concern of Holyoke was the Holyoke Paper Company, which had a mill built in 1857. Orick H. Greenleaf acquired a controlling interest in the company in 1865 and retained his connection until his death in 1896. Mr. Greenleaf, as the senior member of the firm of Greenleaf & Taylor of Springfield, Mass., organized in 1853 as the Greenleaf & Taylor Manufacturing Company, had previously owned a mill in Hunt-

J. C. PARSONS.

MILL OF THE PARSONS PAPER COMPANY.

ington, Mass., run on book, news and writing, and also a former Ames mill in South Springfield. In later years the Holyoke Paper Company was under the management of Oscar S. Greenleaf, brother of Orick H. Greenleaf. The Greenleaf & Taylor Manufacturing Company became the Massasoit Paper Manufacturing Company, with change of owners, in 1870, and soon after another mill was built.

The Whiting Paper Company was organized in 1865, with L. L. Brown of South Adams as president and William Whiting, treasurer and agent. In the course of time William Whiting became president of the concern and his son, William F. Whiting, the treasurer, the latter succeeding to the presidency on the death of his father, with Samuel R. Whiting as treasurer. The senior William Whiting was connected with the Holyoke Paper Company and the Hampden Paper Company before he organized the corporation that bears his name. His first mill, built in 1865, was followed by a second one in 1872. Still later Mr. Whiting organized the Collins Paper Company and built a mill in North Wilbraham, Mass. The Holyoke and the North Wilbraham mills, after twenty-five years or

AARON BAGG.

more of successful operation, had the reputation of being the largest makers of fine writing in the world.

The Newton Brothers, James H., Moses, Daniel H. and John C., were conspicuous in the paper-manufacturing of the Connecticut river valley for half a century. Primarily they were mill constructors, erecting many buildings for mill companies. But they were also operators of some of the mills that they erected and equipped, such as the Franklin and Albion. One of their many enterprises was the first mill of the Crocker Manufacturing Company, which was built by them in 1870 and sold the following year to S. S. and D. P. Crocker. The company made a specialty of collar-paper and added to their property by purchasing the old Albion mill in 1878. Ultimately the company became the Crocker-McElwain Company, manufacturers of bond, bristol, envelope and papeterie papers. Moses Newton was superintendent of the Hampden Paper

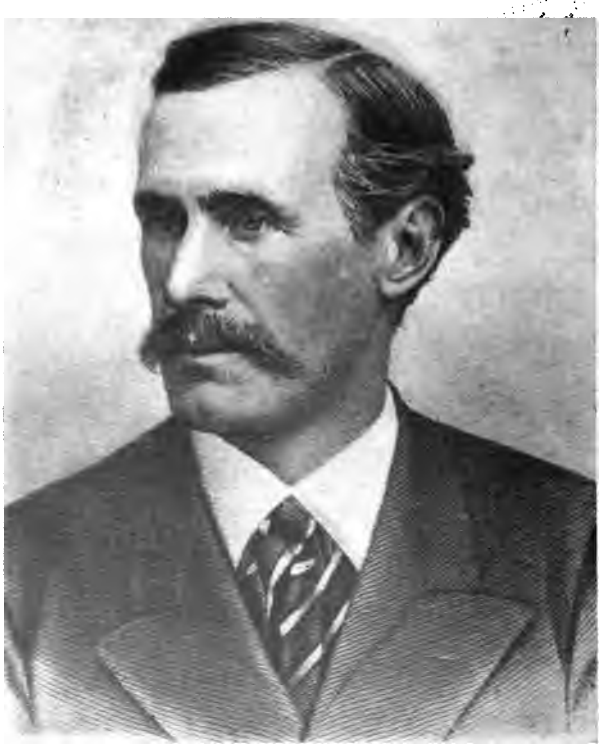
Company and, in 1877, with James Ramage and George A. Clarke, he organized the Newton Paper Company.

The Southworth brothers were engaged in paper-manufacturing in western Massachusetts and Connecticut from the early years of the century, and particularly after 1850. Wells Southworth built a mill in Mittineague, West Springfield, in 1839, and there made fine writing-paper by hand. His mill became the property of the Southworth Manufacturing Company, of which, for more than fifty years, he was president and which later became the Southworth Company, in the control of his son, Horatio W. Southworth. A younger brother, Edward Southworth, was connected with the paper-manufacturing in Mittineague in 1839 and the two brothers also organized the Hampshire Paper Company of South Hadley Falls. A nephew, John H. Southworth, in 1849 and after, was business agent for two mills, one in Poquannock and one

WILLIAM WHITING.

in Rainbow, Conn. With his brothers he had an interest in the Southworth Manufacturing Company and the Hampshire Paper Company, of which he was treasurer.

In South Hadley Falls, across the river from Holyoke, the Carew Manufacturing Company built a mill in 1848, the structure being burned and rebuilt in 1873. Joseph Carew, the treasurer and agent of the company, had his first experience in the South Hadley Falls mill of Howard & Lathrop, the competitors of the celebrated Ameses early in the nineteenth century. In 1830 he took charge of that mill, remaining until it was burned in 1847. In the following year he organized the Carew Manufacturing Company. At its prime the Carew mill had a capacity of three thousand pounds of fine writing every twenty-four



JAMES H. NEWTON.

WELLS SOUTHWORTH.

hours. The business was continuing in 1916, with production increased to twenty-four thousand pounds a day on ledger, linen, bond and writing. The mill was very successful from the start, and, at one time, had acquired the habit of earning an annual one hundred per cent. dividend on the capital of the company and a reserve in addition. The second mill in South Hadley Falls was that of the Hampshire Paper Company, a concern incorporated by the Southworth brothers and several associates. The mill was run on writing and bristol board, but in contemporaneous time has produced bond only.[220]

In Fitchburg, Mass., paper-making began in a single

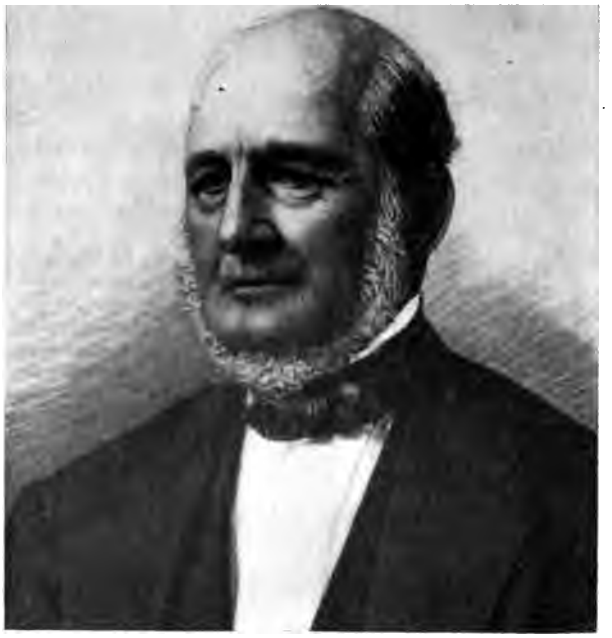
[220] N. B. Sylvester: *History of the Connecticut Valley in Massachusetts,* (1879), II., pp. 626, 890, 915-937, 1052. The *Paper Trade Journal,* October 16, 1897, p. 69. *Lockwood's Directory of the Paper and Stationery Trade,* 1873-1916.

Mill of the Carew Paper Company.

small mill owned by Leonard Burbank of the Worcester family of paper-makers after 1801. Little was done, however, until toward the middle of the century, although Alvah Crocker, with whose name paper-manufacturing in Fitchburg became conspicuously identified, arrived and bought the Burbank mill in 1823. Crocker was born in Leominster, near Fitchburg, his father being a vat-man in the mill of Nichols & Kendall, and

JOSEPH CAREW.

there he learned the trade, afterward working in a mill in Franklin, N. H. In 1826 he built a mill for himself, the second in Fitchburg. He was then only twenty-five years of age. In 1851 he took Gardner S. Burbank as a partner and for sixty-five years the concern of Crocker, Burbank & Co. has continued, first as a partnership and then as a corporation, in the hands of Crocker, Burbank, and Crockers of the second and third generations.



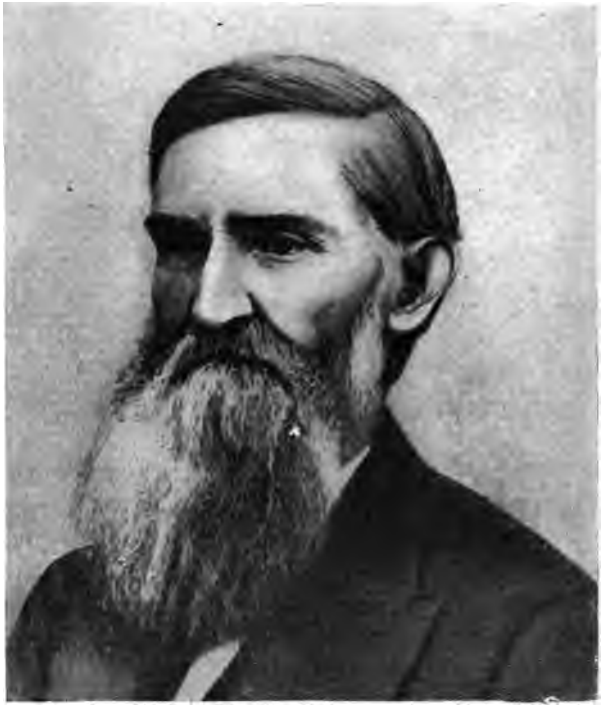
ALVAH CROCKER.

Other mills and their owners in Fitchburg by the middle of the century were: Snow mill, 1839, S. S. Crocker; Cascade, 1847, S. A. Wheeler and partners; Whitney, 1847, Whitney & Bogart; Upton, 1851, Edward Upton and Alvah Crocker; Hanna, 1852, George and Joseph Brown; Lyon, 1853, Moses G. and B. F. Lyon; Stone, 1857, S. A. Wheeler and Joel Ames. Alvah Crocker was interested in several of these from the outset, and ultimately they all became the property of Crocker, Burbank & Co.

Gardner S. Burbank was born into paper-making. He was a son of Abijah Burbank of Millbury, who built the first mill in Worcester county in the revolutionary period and was a cousin of Leonard Burbank. He learned his trade in Montpelier, Vt., worked in the Millbury mill under his uncle, General Caleb Burbank;

worked in Worcester in the mill owned by his uncle, Elijah Burbank; was a partner in the Russell mill with Marshall Field and Cyrus W. Field, in 1846, and arrived in Fitchburg to be a partner with Alvah Crocker five years later. He continued in the firm until 1866, when he retired from active business. He died in 1888.

Another Fitchburg manufacturer of note was Rodney Wallace, who was born in Ipswich, N. H., in 1823, and soon after 1853 was established in Fitchburg as a wholesale dealer in books and stationery. In December, 1864, he was associated with Stephen Shipley and Benjamin Snow in buying the Lyon paper-mill, and beginning business as the West Fitchburg Paper Company. In 1869 he became sole owner of the property, and enlarged the plant by adding two new mills and new and improved machinery, so that a few years later it had a capacity of



G. S. BURBANK.

thirty thousand pounds a day. Mr. Wallace continued to be a manufacturer of paper until his death, when he was succeeded by his sons, Herbert I. and George R. Wallace. In fifty years from its start the one little mill

GEORGE BIRD.

had expanded to a plant of four mills, with a daily capacity of one hundred and forty thousand pounds.[221]

Another paper-maker whose name was associated with Milton was George Bird, who came from Maine in 1795. He purchased water-power and a mill site and built a

[221] D. H. Hurd: *History of Worcester County, Massachusetts,* (1889), III., pp. 275, 310-19.

mill. In 1812 he purchased water rights on the Neponset river in what afterward became the town of Walpole. There he established the paper-manufacturing business that has been in the hands of the Bird family for more than one hundred years. In the second generation Francis W. Bird, who was born in 1809 and died in 1894, was not only a successful paper-manufacturer, but was also one of the noted men in public life in Massachusetts in his generation. Charles S. Bird, who was born in 1855, succeeded his father in ownership and management of the Bird mills. He improved, developed and extended the property until it embraced a box-mill in the original home in Walpole, three mills in Norwood, a mill in Phillipsdale, R. I., and two mills in Canada—one in Pont Rouge, Quebec, and the other in Hamilton, Ontario.

Connecticut had between forty and fifty mills in the decade 1850-60. Special interest attached to several of them. In Buckland, in 1825, Joseph Chamberlain had a mill that had been erected by Richard L. Jones forty years before. Henry Champion, Samuel C. Maxon, William Debit and the Goodwins—George, Henry and Edward—were among the owners who followed Chamberlain. In 1868 this mill was sold to Peter Adams, he who had the distinction of setting up and working the first Fourdrinier in the United States, in Saugerties, New York, in 1827. Adams devoted himself chiefly to writing-paper, and at one time his mill was considered to be one of the largest and best of its kind in the country.

A famous mill of its day was that of the Chelsea Manufacturing Company in Norwich, which was "claimed to be the largest paper-mill establishment, not only in the United States, but the largest in the world."[222] The principal building of the plant was three hundred and seventy-five feet long and there were several detached buildings. The equipment included twenty-six beating engines and six paper-making machines. By the census of 1860 it appeared that seventy-five males and one hundred and five females were employed and the annual product was valued

[222]Frances M. Caulkins: *History of Norwich, Conn.*, p. 620.

at $475,000. At the height of its prosperity David Smith of Norwich and J. C. Rives of *The Congressional Globe*, Washington, D. C., were the principal proprietors. But bigness did not save the establishment, for it failed and was sold out in 1865.

Paper-making began in Windsor Locks about 1836 when Charles Haskell Dexter started to manufacture wrapping in the basement room of an old grist-mill which he owned with Jabez Haskell. Ten years later he built a mill which became the foundation of the works of C. H.

C. H. DEXTER.

Dexter & Sons. In 1856 Persee & Brooks built and put into operation a mill that was reputed to be one of the largest then existing in the country. The business was incorporated with a capital of $450,000, but it met with

financial disaster. Reorganized, the concern became the Seymour Paper Company of contemporaneous times.

A census of the state of New York was taken in 1855. The figures reported were: paper mills, one hundred and nine; capital, $1,584,200; value of product, $2,805,147. The straw-mills were thirty-seven, capital in real estate and machinery, $333,400; value of product, $250,846; persons employed, two hundred and fifty-four.[223]

At the middle of the century Columbia county, New York, and the neighboring region was at the height of its straw-wrapping prosperity. Modern improvements came into use, tubular boilers, steam-dryers and round bleach-vats with false bottoms; the business was stimulated and many new mills were built. On both sides of the Hudson river fifty or more mills were being successfully operated. Gathering the names of these mills and of the men who built and ran them in the days of this top-round prosperity seems like going through a graveyard trying to decipher the names on the old tombstones. A few of them stood out most prominently in their times; the Philip, the Philmont, the Agawamuck, the Garner, the Mesick, the Davis, the Columbia, the Rossman and a score of others. But before the end of the century nearly all these were memories only.

The first Chittenden mills, 1801 and 1809, in Stockport, were followed by others, particularly one that eventually came into possession of J. W. Rossman. This began in 1846 and, in 1862, it was expanded and improved. In 1878 and later the mill had a sixty-two-inch and a sixty-eight-inch machine, with four thirty-six-inch engines and produced fourteen hundred reams of wrapping paper a day. A mill built in Chatham, about 1840, by Dickey & Wilder, who had been there from 1828, was acquired by the Gilbert brothers and became widely known. It was running as late as 1880 and had a capacity of several hundred tons a year, operating one fifty-inch and one thirty-six-inch machine. Staats D. Tompkins, one of the most noted men of his time and place, owned three mills,

[223] Franklin B. Hough: *Census of the State of New York for 1855*, (1857), pp. 188, 348, 419, 432.

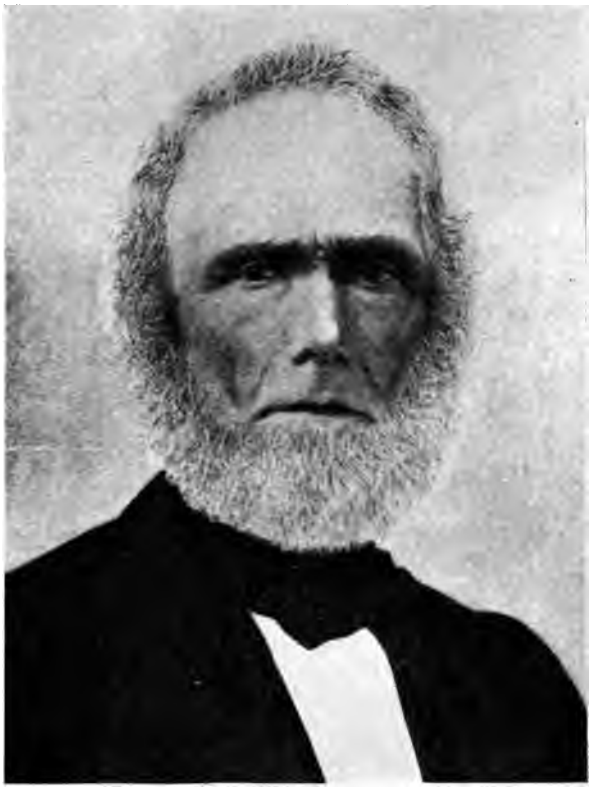
one in Chatham Centre, one near Chatham Four Corners and one in Rensselaer county. The mill in Chatham Centre was considered a marvel, because it was the first double mill known in that section, having four beaters and two forty-eight-inch machines. It afterward became well known as the Bullis Mill.

One of the most famous mills of the period was that built about 1845 by Samuel Hanna and Horace W. Peaslee at Malden Bridge. It was built to run on rag paper, but was not successful and was turned to straw. Peaslee was a mechanical genius and brought out many new inventions. The mill was operated by the Rossmans of Stockport in 1900. Others active in the business at this time and later were: Plato B. Moore, in Marcellus Falls, the Smarts in Troy, the Rossmans and the Van DeCarrs in Stockport, Carpenter & Peaslee in Ancram, Edward Coventry in Stuyvesant Falls, Charles E. Brigham in Blue Stone, George H. Phillip, Horton & Harder, Samuel Rogers, J. D. Shufelt, Louis M. Payne and J. H. Garner in Chatham.

Just prior to the civil war the demand for straw paper was not large and prices were small. For several years the business was at a rather low ebb. From 1862 to 1870 there was a boom. Paper could not be produced fast enough to supply the demand and new mills were rushed up in a hurry while the old ones were enlarged. Prices went up as high as $1.10 per ream of ten pounds. The demand for rye straw was enormous and prices ranged from fifteen to thirty dollars a ton. But the fall came. Manufacturing was inflated, prices could not be maintained and rye straw could no longer be bought cheap. That was the beginning of the end. In the early seventies the production of straw-paper was well established in the western states and it was not long before that section had the monopoly of that kind of paper-making. Locations, new mills, water-power, wages, raw material, markets and facilities generally were more favorable in the west than in the east. The small mills in New York gradually gave up the struggle and before the end of the century fully two-thirds of them had been dismantled or had been

turned over to the manufacture of other kinds of paper.[224]

The Knowltons, who had been in Watertown, N. Y., from 1824, continued, in this period, to be factors in paper-manufacturing in northern New York. The original firm of Knowlton & Rice retired in 1854, but after a



ILLUSTRIOUS REMINGTON.

few years of operation by other owners, the sons of the pioneer Knowlton, John C. and George W., Jr., bought the mill in 1861, added to it other properties and expanded the business to the extent that it has been known as the Kamargo Mill for more than a generation since. First

[224] *Columbia County at the End of the Century.* (1900). Franklin Ellis: *History of Columbia County, New York,* (1878). *The Paper Trade Journal,* October 16, 1897, pp. 84-90.

this mill, like most others, made wrapping, news, book, letter and other varieties, but in the course of time it was devoted entirely to writing paper and still later to cover paper and specialties.

The Remingtons came into Jefferson county in 1854, when Illustrious Remington and his sons, Hiram and Alfred D. Remington, who had been paper-manufacturers in Fayetteville, Onondaga county, leased and fitted up an old cotton-mill in Jewettsville with four rag engines and an eighty-four-inch Fourdrinier and made one ton of paper. Alfred D. Remington, a man of extraordinary business ability, gave a decided impulse to the industry on the Black river. In 1865 he organized the Remington Paper Company, which in a few years became one of the biggest plants in the country. Before the end of the century the

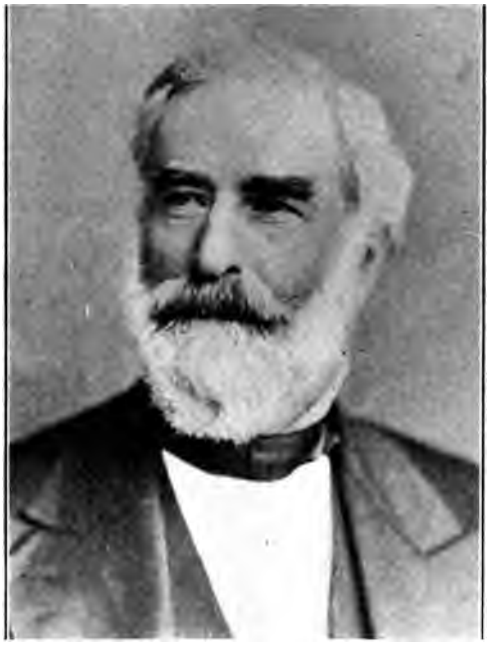
B. B. TAGGART.

company was operating two paper-mills, three wood-pulp mills and a sulphite mill, and was making and using thirty tons of wood-pulp a day, all from spruce. Another Remington mill was built on Sewall's island in 1862 and was many years operated by Charles and Hiram Remington, but after 1881 by Hiram Remington & Son, under the name of the Watertown Paper Company, with a paper and a pulp mill. Charles R. Remington and his son Charles H. Remington, as the C. R. Remington & Son Company, built in 1882 a mill for news with a capacity of twenty-five tons daily and a mill for wood-pulp with a capacity of twelve tons daily.

B. B. Taggart, born in 1831, bought an old mill in Pamelia, within the corporate limits of Watertown, in 1866, and put in machinery for making news and manilla. This was the beginning of the Taggarts Brothers Company, and they made rope papers and flour sacks. The concern went extensively into the manufacturing of paper bags. From the outset W. W. Taggart, a brother of B. B. Taggart, had part in the enterprise. Another mill was built at Felts Mills, and this was occupied by the Taggart Paper Company for making news.

At the close of the century there were eleven paper-manufacturing companies in Jefferson county: Knowlton Brothers, the Remington Paper Company, the Taggarts Paper Company, the Watertown Paper Company, C. R. Remington & Son, the Ontario Paper Company and the Taggarts Brothers Company, in Watertown; the Globe Paper Company and the Brownville Box & Paper Company, in Brownville; the Frontenac Paper Company and the St. Lawrence Paper Company, in Dexter. Knowlton Brothers, the Remington Paper Company and the Taggarts Paper Company each had two mills. The full daily capacity of all these mills was three hundred and thirty-two thousand pounds, and all made news, except Knowlton Brothers, who made manilla colored paper.

In this region the Remington Paper Company was the first to start a mill for grinding wood-pulp. This was in 1869, two years after the process had been introduced into the United States. Taggart Brothers followed with



MARTIN NIXON.

a mill in 1872 and then, in addition, between 1882 and 1889, the Knowltons and the Ontario Paper Company in Watertown, the Jefferson Paper Company of Black River, the St. Lawrence Paper Company of Dexter and ten other concerns in Brownville, Dexter, Carthage, Great Bend and Black River took up the work. All these were in operation in 1897 and their combined daily capacity was two hundred and thirty-four thousand pounds. Most of these mills were run by the paper-manufacturers to supply their own needs for pulp, but a limited part of the product was sent away.[225]

Within Philadelphia county, Pennsylvania, there was much activity in paper-manufacturing in the years immediately following the middle of the century. Only a few of the names of the mill proprietors of this time and a

[225]John A. Haddock; *History of Jefferson County, New York,* (1895), pp. 202-210. *The Paper Trade Journal,* October 16, 1897, p. 45.

little later need be enumerated here. Among them were Joseph Duckett, Charles Megargee, Sylvester Erwin, Joseph Stelwagen, Jacob D. Heft, Theodore Megargee, Charles Wells, Morris L. Keen, Sebastian Rudolph, John W. Dixon, E. R. Cope, Alfred D. Jessup, B. H. Moore, Henry Nixon, Martin Nixon, E. C. Warren, P. H. Warren, John Lang, Casper Garrett and Alexander Balfour, without prejudice against others whose names have been passed by. On the Crum, Darby, Mill and Pennypack creeks were numerous mills, but nearly all passed away before the end of the century.

One of the famous mills on the Wissahickon creek in this period was that with which the Megargees were long identified. The house of Charles Megargee was established in 1830 and was long one of the most flourishing concerns in the business. The Megargee Wissahickon mill was one of the finest of its time. It had a long and honorable career, passing through many hands before it came into the possession of the Megargees, about 1850,

WILLIAM H. NIXON.

and it was operated by them until 1884, when it was taken by the municipal park commission and torn down.

For more than two generations the Nixons had a large part in paper-manufacturing in and about Philadelphia. They naturally came by their disposition to the industry by line of inheritance. Martin Nixon was a son of Daniel Adams Nixon and his mother was Susanna Rittenhouse daughter of Martin Rittenhouse who was of the famous Rittenhouse family of paper manufacturers, being in the fourth generation from William Rittenhouse, the first American paper-maker, in 1690. Martin Nixon, thus by heredity a paper-maker, began work in the early part of the century. For some years, before and after 1839, he owned and operated a noted Manayunk mill, the Eckstein, built and first operated by Samuel Eckstein. Writing and sugar-loaf papers were there made and the mill continued in existence until well toward the end of the century.

A half century later Martin Nixon and his nephew William H. Nixon established the firm of Martin & Wm. H. Nixon which was incorporated in 1888. Previous to that time they had been located at Manayunk where they had the first building of what afterward became the big plant of the Flat Rock Mills of contemporaneous times. Feinour & Nixon were on this Manayunk site from 1844 and it was there that straw-pulp was made in 1854 and soda-pulp first used about ten years later.[226]

Most of the mills of this and earlier date advertised themselves with elaborately engraved trade-marks that were attached to each bundle of paper sent out. That of the Humphreysville mill in Connecticut has been pictured on another page of this book.[227] That of the McDowell mill in Philadelphia was another good example of its kind. It was used in 1825 and after, and probably before. Joseph McDowell, first of the name in the industry, was born in 1791 and learned the trade of making paper in New London Cross Roads, Chester county, Penn. He became one of the foremost manufacturers of paper in Pennsylvania, having first a mill on the Pennypack

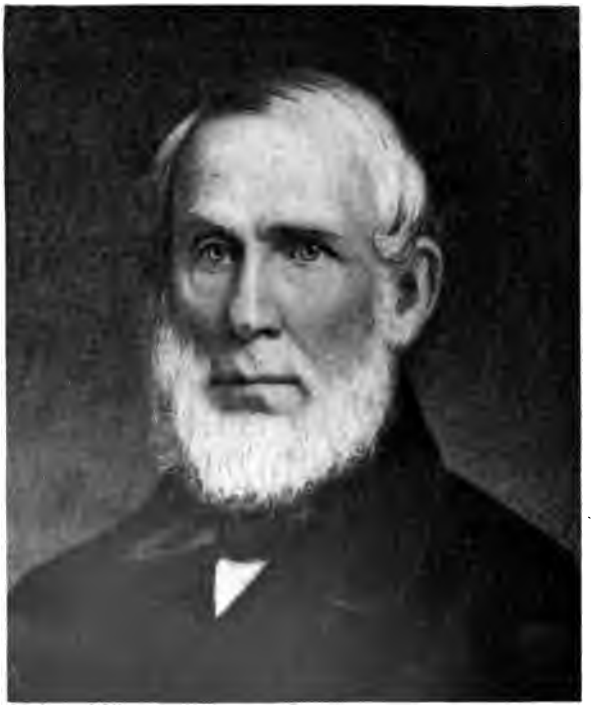
[226] See page 223 and 228, *ante*.
[227] See page 141, *ante*.

creek, Montgomery county, and then one in Manayunk where he made writing-paper until the mill was burned in 1858. F. W. McDowell, son of Joseph McDowell, learned the trade in the mill of his father and during his long life was active in the business in Philadelphia, connected with the Megargees and Jessup & Moore. In the third generation, Charles McDowell continued the business, 1916, in two mills where his grandfather began.

Paper-manufacturing in the southern states never attained great importance. Prior to the civil war the industry there did not exist much more than merely hopefully. Scattered mills were built and run in a desultory way in

A Paper-mill Trade-mark of 1825.

Kentucky, Tennessee, Texas, South Carolina and elsewhere, as has been noted on preceding pages of this history, but that was about all.[228] In 1847 the publishers of *The New Orleans Bulletin* announced that they were using paper manufactured by themselves at a "mill in the third municipality," which they then believed was the only successful attempt to manufacture paper as far south as



JOSEPH MCDOWELL.

Louisiana." But the United States census of 1850 did not find this mill. Two mills were then working in Georgia. The editor of *The Savannah Republican,* commenting upon the fact, said that a few years before he had despaired of living long enough to see such an achievement. A Georgia man, writing in 1846, called attention to the need of a

[228] See page 168, *ante.*

paper-mill in that section. He said that there was then no mill in Georgia or Alabama, the paper consumed in those states being procured from the north, with the exception of a small portion supplied by two mills in Greenville, S. C., which mills were working under the disadvantage of being obliged to bring in their raw materials and then to transport out to the market their manufactured paper, a distance of two hundred miles, by wagon.[229]

Just before the war William S. Whiteman, third of the name, who had been active in paper-making in Tennessee, following his father and his grandfather, built another mill in the old Stone Fort, near Manchester. One of Whiteman mills was operated successfully on news, book, manilla and wrapping until the fall of Fort Donelson in 1862. Throughout the war it never stopped running, night or day or Sunday, except to clean the boilers. Its product, the largest of any mill in the south, was shipped to every point that could be reached outside the state. Confederate bank notes and other government securities were printed on paper there made.

When the war broke out in 1861 there were fifteen mills in the states that seceded. They produced seventy-five thousand pounds of paper daily while the daily consumption in that part of the country was over one hundred and fifty thousand pounds, fully one half the supply being drawn from Europe and from mills of the west. An entire suspension of newspaper publishing was at once imminent and the burning of the mill in Augusta, Ga., in 1863, the largest in the south, intensified the seriousness of the situation. Other paper mills of the period were located in Richmond, Va., one in South Carolina, probably at Bath; and one in Marietta, Ga., operated by James Byrd, an uncle of William S. Whiteman, of Nashville. As wires and felts were not manufactured they were brought through the lines by blockade runners, being hauled in wagons through the mountains of Virginia, Kentucky, Tennessee and Georgia.[230]

[229]Freeman Hunt: *The Merchants Magazine,* xv, p. 416.

[230]R. A. Halley: *Paper Making in Tennessee,* ix, (1904), p. 215. *The Paper Trade Journal,* October 16, 1897.

CHAPTER THIRTEEN

AN ERA OF PROSPERITY

IN THE YEARS FOLLOWING THE CIVIL WAR—A UNIQUE DIRECTORY OF 1864—GROWTH OF THE INDUSTRY IN OHIO—FUTILE ATTEMPTS TO START PAPER-MAKING IN UTAH—FOUNDING THE INDUSTRY IN THE NORTH-WEST—RAPID ADVANCEMENT IN HOLYOKE, MASSACHUSETTS—SOME AMAZING PRICES OF THAT PERIOD

IN the prosperity that followed the civil war and held the country for a decade paper-manufacturing had its share. For four years the civil war was, on the whole, a retardant force, for the southern market for paper was cut off, although selling prices were high, and the cost of raw material increased more proportionately. But change came quick after peace and improvement was decided and on large scale. Old mills were expanded, improved machinery and methods were introduced and new mills on a scale heretofore unthought of were built. Paper commanded high prices though the demand was shifting, now strong, now weak, but on the whole good. Progression toward larger establishments, business on an extensive scale, and concentration of manufacturing in certain favorable localities which had started during the preceding generation had become a marked feature of the period. Particular lines of development that were to dominate the industry until into the next century were clearly manifest and all else was giving way to this movement. Many things contributed to bring on this notable change in the business as a whole. Machinery had displaced the old hand process that, however admirable in

results, was too slow for modern needs. New materials, straw, manilla and wood, had come in, or were about to come in, to help out the rag situation. Capital was recovering from the financial panics and was seeking investment. Foreign imports had not increased in proportion to the increase in population and home needs. Transportation facilities, which had already favorably affected the business were now substantial factors in it.

More than ever before it was now possible, as well as desirable, to group mills in localities where water power, ready availability of raw material and accessibility to markets were prime considerations. Already for these reasons Berkshire county in Massachusetts, Hartford county in Connecticut, Philadelphia, Chester and Delaware counties in Pennsylvania, and other places, were paper-manufacturing centers of importance and were growing. Jefferson, Niagara and Columbia counties in New York, Holyoke in Massachusetts, the Miami valley in Ohio, and Indiana, and Wisconsin, were about to be added to the list of places where branches of the industry should be concentrated with many mills and big mills and on an unprecedented scale of production. The really great age of American paper-manufacturing was in sight although not fully to appear for half a century.

According to the census of 1860 there were five hundred and fifty-five paper mills in twenty-four states: Maine, New Hampshire, Vermont, Massachussetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa, Maryland, Virginia, Tennessee, Kentucky, Georgia, South Carolina, North Carolina and California. In New England were two hundred and four mills; in the middle states, two hundred and seventy-three; in the western states, fifty-three; in the southern states, twenty-four, and in California, one. These mills had a capital of $14,052,683, employed six thousand five hundred and nineteen males and four thousand three hundred and ninety-two females and had an annual product of $21,216,802 which was an increase of more than one hun-

dred per cent. upon the product in 1850. Of the total product, amounting to 253,778,240 pounds, printing paper was 131,508,000 pounds, writing 22,268,000 pounds, wrapping 33,379 tons, and lesser quantities of colored, bank-note, wall paper, straw board and other specialties. New England produced to the value of $10,502,069, nearly one half of the whole and more than was produced in the entire United States in 1850. Massachusetts alone reported a value of $6,170,127 as against $7,908,437 for the five middle states. About sixty-five per cent. of the entire amount of paper-stock came from domestic rags and twelve per cent. from cotton waste, rope and bagging. The remainder was imported, the value of rags imported for 1860 being $1,540,224, an advance of $529,789 from 1854 and of $791,517 from 1850. The paper product was greater in quantity than that made either in Great Britain or France and the consumption greater than the consumption in both those countries combined.

A unique directory was made in 1864 by W. A. Brewer of New York city. It was simply a specially prepared blank book in which the information was written. Manuscript copies of it were sold to subscribers and it was the first attempt at a directory in this field. The title was: *Catalogue of Paper Manufacturers in the United States, Territories, Canada, etc., with the Statistics of the Mills, Compiled from Various Sources, 1864.* A preface and a table of contents preceded the list of mills which were arranged by states. Each page was divided into eleven columns the headings of which were: names of mills and proprietors or agents; town or city where located; description of paper manufactured; engines, running time, cylinders, Fourdrinier machines; investment or capital employed in lands, buildings, machinery, etc; value of annual product; number of hands employed; remarks. In the preface, under date of May, 1864, Mr. Brewer said:

> "A manuscript catalogue in the possession of a manufacturer formed the basis of this. But the compiler has been able to correct and make additions to the addresses of mills in about seventy instances,

> and, by personal interviews and correspondence with the proprietors of about three hundred mills, the statistics have been corrected and added to in about five hundred instances. The columns denoting the investment in lands, buildings and machinery and the value of annual product constitute an original feature, so that while the present work cannot be supposed to be entirely perfect it may be fairly considered to be the most accurate catalogue of paper manufacturers and mills now extant."

Despite its many inaccuracies and short-comings this book, undoubtedly, then served its purpose for the trade very well indeed and to-day it is exceedingly interesting and valuable as an historical document. Substantially it presents an account of the industry at the close of the civil war, such as could not now be derived from any other sources. According to Mr. Brewer there were then in the United States, paper-manufacturing concerns to the number of eight hundred and thirty-five, distributed as follows: Maine, sixteen; New Hampshire, thirty-one; Vermont, thirty-five; Massachusetts, one hundred and seventeen; Connecticut, seventy-eight; New York, two hundred and twenty-three; New Jersey, sixty-three; Delaware, three; Pennsylvania, one hundred and twenty-seven; Maryland, thirty-eight; Virginia, twelve; North Carolina, two; South Carolina, four; Georgia, two; Tennessee, five; Kentucky, two; Ohio, thirty-four; Michigan, seven; Indiana, fifteen; Illlinois, fifteen; Wisconsin, fifteen; Minnesota, one.

In Maine the largest concern was Grant, Warren & Co., which was reported as having three Fourdrinier machines, the largest sixty-eight inches, a capital of $100,000, an annual product of $40,000 and one hundred employees. A. C. Denison & Co. was listed with $100,000 capital and $150,000 annual output. Other concerns were in Mechanic Falls, Gardiner, Vassalboro, Hampden, South Orrington, Waterville, Portland, Belfast and Bloomfield. Among them were Drake, Dwinal & Co., Richards & Hoskins, James Freeman & Co., George F. White & Co., Wm. Russell & Son and J. & B. Crosby & Co., strangely

unfamiliar names a half century later. In New Hampshire there were mills in Manchester, Exeter, Newmarket, Bennington, Claremont, Alstead, Holderness, Bristol, Franklin, Peterboro, Conway, Brentwood and Haverhill. Only five of these thirteen places had mills fifty years later. Holderness, for example, which then had seven mills, was not on the paper-trade map in 1916. The names of all the thirty concerns listed had disappeared from the industry by that time.

Asa Low in Bradford was the leading manufacturer in Vermont. He had ten engines and three cylinder machines, thirty-two, thirty-four and forty-two inches wide and he made wrapping and printing papers. One lone Fourdrinier in the state was in the mill of G. Benton & Sons, Bennington, who had a capital of $40,000, employed thirty-six hands and annually produced paper to the value of $60,000.

In the Massachusetts list of one hundred and seventeen firms we come upon names that were conspicuous in the annals down to much later times and some of them even into the opening years of the twentieth century: Crehore, Bird, Tileston, Rice, Hollingsworth, Russell, Curtis, Crocker, Burbank, Wheelwright, Smith, Parsons, Southworth, Greenleaf, Crane, Carson, Whitney, Warren, Gould and Roberts. And the principal places listed—Newton Lower Falls, Walpole, Lawrence, Fitchburg, South Hadley Falls, Dalton, Lee, Watertown, Russell, Waltham, Westfield, North Leominster, Mittineague and Holyoke showed that the industry in this state had not abandoned its earlier homes, in those five decades, even though it had also over-flowed into other localities. All these Massachusetts mills seem to have been busy establishments. Most of them were credited with making full time while some of them were running twelve, fourteen, fifteen and sixteen hours a day.

In Connecticut the leading mills were in Manchester, Norwich, Hartford, East Hartford, Windsor Locks, South Manchester and Unionville and the leading manufacturers were the Chelsea Manufacturing Company, N.

H. Hubbard & Co., George Bunce & Co., Boswell, Keeney & Co., W. & E. Bunce & Sons, Goodwin & Sheldon, Persee & Brooks, C. H. Dexter, Converse, Chapman & Burbank, Platner & Porter, and Case Brothers.

In New York state many of the mills reported were engaged in making paper from straw, especially in Columbia county where, in the town of Chatham alone, there were fourteen mills. Troy had six manufacturers, Milton five, Ballston Spa six, Little Falls seven and Watertown three. Nearly all the machines used were of the cylinder type, only seventeen Fourdriniers being reported for the state. Among the products were writing, straw-wrapping, strawboards, card, bonnet-boards and printings.

Paper-mills in New Jersey were then in Morristown, Chatham, Bloomfield, Millburn, Springfield, New Prospect, Belleville and Trenton, only Morristown, Bloomfield and Millburn having lasted out the century as paper-manufacturing localities and that too in minor rank. Singularly, with less than one-third the number of firms in the business, New Jersey had nearly as many Fourdriniers at work as New York, thirteen as against seventeen; but still most of the machines were cylinders.

The three concerns listed in Delaware were Curtis & Brother and R. Lysle in Newark and Jessup & Moore in Wilmington, but that omitted the ancient Sunny Dale mill of Francis Tempest in Beaver Valley. The Curtis, the Jessup & Moore and the Sunny Dale establishments have endured until 1916. In Maryland the majority of the mills were in Elkton, Union Meeting House and Freeland.

Only the names of the one hundred and twenty-seven firms in Pennsylvania were given, and their locations. Foremost among these were J. M. Dowdie, Thomas K. Amies, J. Duckett, J. M. Willcox & Co., E. C. & P. H. Warren, Joseph Stilwagon and Martin C. Nixon of Philadelphia; Givins & Brown, Robinson & Co., W. B. Mullen and S. & I. Lagg of Papertown; S. B. & C. P. Markle and S. & P. Markle of West Newton; Wolff & Heyser, William & J. Heyser, Jacob Heyser, Lambert & Hubert and Stauffer, Strickles & Co. in Chambersburg;

D. E. MEAD.

J. Howard Lewis and —— Matthews in Darby; Kempton & Mullin and Mullin & Son in Mt. Holly Springs; Martin Nixon, Joseph Duckett and Finour & Nixon in Manayunk. This list, both as to names of firms and localities, is quite as noteworthy for its omissions as for those included in it.

In Ohio paper-making had been going on slowly since its beginning before the middle of the century, but the industry there did not assume large proportions until about the time of the civil war and after. In the Miami valley, paper was made in one lone mill about 1840. Located on the Miami river near Hamilton it was known by the name of its owner and operator, Thomas Graham. The mill was run by water-power and had a varied product, ruled and unruled writing, printing, white and blue lined bonnet boards, and wrappings.

In 1848 the Dayton Paper Mills were started by Ellis, Claflin & Co. In 1856, W. A. Weston, J. L. Weston and

D. E. Mead, as Weston & Mead, bought the property which, as time went on, was owned by Mead & Weston, Mead & Nixon, the Mead & Nixon Paper Company and the Mead Paper Company, Colonel Mead being in all these years the dominant spirit in the business until his death in 1891. Charles D. Mead succeeded his father and the concern, until after 1900, operated the mills in Dayton and pulp and paper mills in Chillicothe. For years the Dayton mill manufactured news, but the later product was book paper. It was one of the first mills in the west to make chemical wood pulp. In 1900, a soda pulp mill was run in connection with the Chillicothe plant.

A. E. Harding with George H. Irwin and Abram Upp, under the name of Harding, Irwin & Co., built a mill, which they called the Excello, on the Erie canal near Middletown, equipped it with a sixty-two inch machine and started running in November, 1865, making, they

A. E. HARDING.

THOMAS BECKETT.

claimed, the first writing paper west of the Allegheny mountains. In 1873 the Harding Paper Company was organized and a mill built in Franklin. With the usual accompaniment of disasters by fire these mills continued to be operated by the Harding Paper Company, making writing, until in the next century when (1916) they were a division of the American Writing Paper Company.

In Dayton a board mill was built in 1863 by William Clarke and Calvin L. Hawes—the Clarke & Hawes Company and, in 1872, after the death of Mr. Clarke, the C. L. Hawes Company. It had four machines capable of producing, annually, about one thousand and two hundred tons, valued at $90,000. Forty years later, having become part of the American Straw Board Company, it was equipped with eight machines and nineteen engines and had a capacity of eight-five thousand pounds in twenty-four hours; but it was idle.

William Beckett and Thomas P. Rigdon started a mill in Hamilton, in 1849, where the first Fourdrinier in Ohio was put in. Adam Laurie was the manager and in 1854 he secured an interest in the concern which became Beckett & Laurie. Thomas Beckett and Adam Laurie Jr. entered the firm in 1885 and two years later the Laurie interests were purchased by the Becketts and the Beckett Paper Company was incorporated, so remaining into the next century.

Other enterprises in the Miami Valley during the last half of the century were: that of Rutledge & Co., built in Dayton, before the war, afterward the property of the Columbia Straw Company; the Levis of Dayton; the Nixon paper and bag factory of Dayton and Richmond, Ind.; the George H. Friend mills in Lockland and Carrollton; the William Levis mill in Miamisburg, after 1890

ADAM LAURIE.

owned by the Friend Paper Company; the second Levis mill in Miamisburg, the beginning of the Ohio Paper Company; the Franklin Paper Company, the Friend and Forgy Paper Company, and the Eagle Paper Company of Franklin; the Erwin, McGuire and Kline mill and the Snider mills in Hamilton, 1853-93; the Wrenn Paper Company, the Wardlow-Thomas Paper Company, the Oglesby Paper Company, the Tytus Paper Company, the Colin Gardner Paper Company and the Middletown Paper Company of Middletown; the Champion Coated Paper Mills which, started in 1895 by Peter G. Thomson, became, in a few years, the most imposing establishment of its kind in the country. And the list could be further extended without exhausting the record. Some of these mills had short and troublesome existence; others became substantial and profitable, the main stay of the industry in this region in contemporaneous times.[231]

The first known mill in Wisconsin was built in 1846 or 1848 by Ludington & Garland in Milwaukee. It was a four-story brick structure that cost $10,000, contained two engines and a cylinder machine, was operated by steam and ran on printing and wrapping. In 1849 the mill was owned by D. Cameron who had ten employees with a pay roll of forty dollars a week and produced weekly about one hundred and ten reams of paper, sufficient, it was claimed, "to supply the entire press of the state," besides sending some to the market in Chicago. After a few years this mill was dismantled, the machinery being sold to Noonan & McNab, who build a new mill at Humboldt. This was equipped with two engines and a forty-two-inch cylinder, and was operated until about 1867.

Ernest Prieger built a mill in 1855 on the Menomonee river; it lasted for nearly twenty years, being at one time owned by Noonan & McNab. Another mill was built in Milwaukee in 1864 by Alexander Mills, and was run for about two years when it was destroyed by an explosion.

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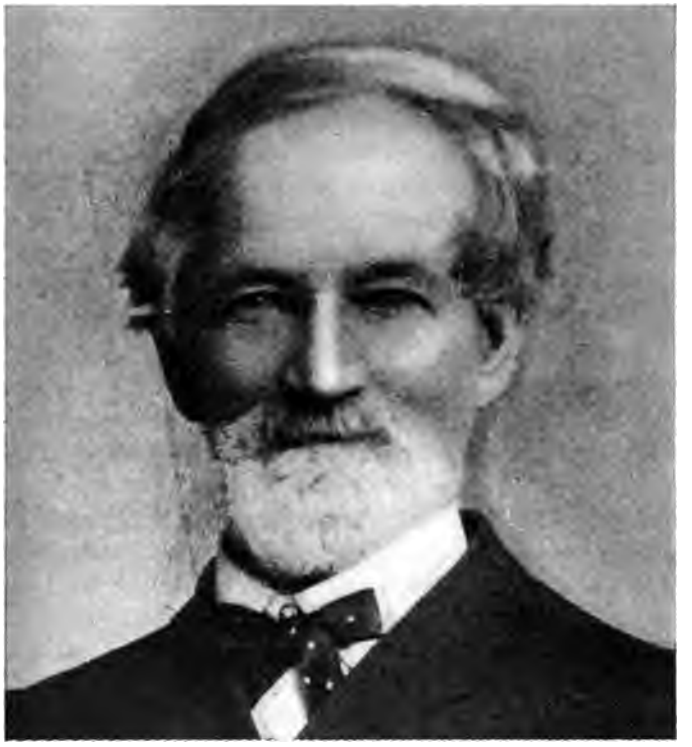
[231] Stephen D. Cone; *Concise History of Hamilton, Ohio,* (1901), I., 386, 397; II., 283-90, 332. *The Paper Trade Journal,* October 16, 1897, pp. 92-96.

In the Fox river region Appleton had its first mill in 1853 built by the two Richmond brothers and run on wrapping until it was burned in 1860. About the same time the Kimberlys built a mill in Waterford, but the plant was abandoned later. At Beloit, in 1855, Wright, Merrill & Newcombe erected a mill with two engines and a forty-two-inch cylinder to make news. This was afterward owned by the Rocky River Paper Company. A second mill was built at Beloit in 1857. Another mill was created by Merrill out of a saw-mill and these three mills finally became the property of the Beloit Straw Board Company. Another early concern in Beloit was F. N. Davis & Co., who ran a mill on specialties, one of which was a rye straw-board for floor covering. In Whitewater, between 1857 and 1860, J. H. Crocker built a mill and for ten years operated it on printing and tea papers, its daily capacity being three and one-half tons. Denison & Turner were later owners of this mill, increasing its capacity and devoting it to straw wrapping. Before 1872 or thereabout, other manufacturers were J. L. Mathers in Sparta and George Hunter and Nightingale, Bosworth & Co. in Fond du Lac. Two pulp mills were started in Appleton, one by Bradner Smith & Co. of Chicago and the other by the Ames Wood Pulp Company. Together they had a daily output of eight thousand pounds of dry pulp which was a large product for that time.

The first mill in Neenah was built in 1865-66 by a small stock company composed of Hiram and Edward Smith, Dr. N. S. Robinson, John Jamison, Moses Hooper and Nathan Cobb. The building that was used was known as "the old red Neenah mill" and manufacturing was carried on successfully under different management for nearly ten years. Colonel Haynes, one of the pioneer paper-makers of Wisconsin, controlled the mill, which ultimately came into possession of the Kimberly & Clark Company. At first this mill made from two thousand five hundred to three thousand pounds of paper a day. In 1870 the *Chicago Tribune* noted that the company "received an order for ten tons of paper for the *Tribune*, made the order and



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shipped it inside of sixty hours." These were the beginnings, small, indeed, of paper-manufacturing in Wisconsin. They bear little comparison to the status to which the industry attained before the end of the century.[282]

In November, 1851, the first attempt to build a paper-mill in Utah was made. This project was started on Mill creek near Salt Lake city by Thomas Howard and Sydney Roberts, but was abandoned in a few months, after the mill race and the pit for the water-wheel had been built. In the following year Howard and Thomas Hollis arranged with Brigham Young to utilize machinery that had been intended for a beet sugar factory. They converted the

[282] Publius V. Lawson: *Paper-Making in Wisconsin.* In *Proceedings of the State Historical Society for Wisconsin,* (1909), pp. 273-280. *The Paper Trade Journal,* October 16, 1897, p. 37.

beet grinder into an eighty-pound rag-engine and availed themselves of water-power on Temple Block in Salt Lake city. Years afterward Mr. Howard wrote the story of their operations.[233]

In June, 1854, they were able to begin the manufacture of paper by hand, the first to be made west of the Missouri river. But the experiment lasted only six months, for the sugar factory demanded its machinery and the paper-mill was closed. In 1860 Brigham Young purchased a cylinder machine and Howard was engaged to convert the old sugar-mill into a paper-mill where he began making paper by machinery in the following year. In 1863 this mill was succeeded by the Granite mill built near Salt Lake City and equipped with a Fourdriner and other modern machinery. The Granite mill continued operations until 1893 when it was burned.

In the years immediately following the civil war paper manufacturing in Holyoke, Mass., advanced rapidly. Charles O. Chapin and James Kirkham organized the Riverside Paper Company in 1866 and in the following year built a mill, which, after 1871, was owned by L. J. Powers and J. H. Appleton. In 1892 a second mill was added to the plant and subsequently a third. The Franklin Paper Company, also organized in 1866, had Calvin Taft as president, and his son-in-law, James H. Newton, as treasurer and agent. It was run on collar-paper, but after paper collars went out of fashion it made bristol board. The Albion Paper Company was organized in 1869 and purchased the mill of the Hampden Paper Company, built in 1862 by the Newton Brothers and run by them on collar-paper. Afterward, in 1878 and in 1879, the Albion Company built new mills larger and better equipped, to run on book and later on writing. The Union Paper Manufacturing Company was organized in 1870 by Henry and Edward Dickinson, J. E. Taylor and D. D. Warren. The company began work in the mill which they purchased from the Bemis Paper Company, an older concern, and continued in business until 1888,

[233] *The Paper Trade Journal,* October 16, 1897, p. 106.

when it became the Connecticut River Paper Company. Jared Beebe started in business in 1871 as the Hampden Paper Company, making fine writing. Presently he was joined by George B. Holbrook under the firm name of Beebe & Holbrook, the business being incorporated in 1878, after the death of Mr. Beebe in 1876, with Mr. Holbrook as president and treasurer.

Other Holyoke concerns in the closing quarter of the century were the Chemical Paper Company, 1880; the Nonotuck Paper Company, 1880; the George R. Dickinson Paper Company, 1882; the George C. Gill Company, 1891; the Norman Paper Company, 1891; the Linden Paper Company, 1892; the Winona Paper Company, 1892; the Syms & Dudley Company, and Newton & Ramage, 1873, which was succeeded by the Newton Paper Company in 1876. Some of the noteworthy mills of this period were the Wauregan, built by J. N. Newton in 1879; the Valley, built in 1864, for the Valley Paper Company, founded by David M. Butterfield; the Holyoke manilla, managed, after 1875, by Robertson, Black & Co.; the Excelsior, built in 1872, by D. H. & J. C. Newton, and sold to J. B. Warren, R. C. Dickinson, George R. Dickinson and A. N. Mayo. Holyoke had a pulp mill in 1876 owned by the Connecticut River Pulp Mill Company, which made four tons of soda pulp a day.

In 1873 Holyoke, twenty years after the first mill was built there, had fifteen mills operated by fourteen concerns. The daily capacity of these mills was forty-eight and one-half tons. Twenty-five years later, 1897, the "paper city" had twenty-one concerns operating twenty-six mills with a daily capacity of three hundred and seventeen tons. In 1873 the fifteen mills had three cylinder machines and sixteen Fourdriniers. In 1897 the twenty-six mills had six cylinders and fifty-three Fourdriniers. To carry the comparison still further, in 1916, sixty-three years after the first Parsons mill, Holyoke had twenty-seven mills, operated by twenty-two concerns. In these mills there were six cylinders and fifty Fourdriniers. The daily capacity of these mills was four hundred and fifty tons, and

their product, while largely writing, envelope, book, bond, linen and ledger, included besides nearly every conceivable kind of paper, except news and straw board.

Heavy increase in the consumption of paper, especially all kinds of book and news, was a feature of two or three decades immediately preceding the civil war, yet American manufacturers were able mostly to meet the demand. The protective policy of the national government which had placed duties on paper, changeable, it is true, but generally high, had worked to the exclusion of importations except French writing papers, and that notwithstanding capital and labor were cheaper in Europe than in this country. In 1789 the duty was seven and one-half per cent. *ad valorem;* in 1816, thirty per cent.; in 1828, from ten to twenty cents a pound; between 1825 and 1845, reduced; in 1846, thirty per cent.; in 1857, twenty-four per cent.; in 1862, thirty per cent. Rags generally had always been admitted free of duty.

In 1854 there was a rise of two and one-half cents a pound for news. Publishers of newspapers were dismayed, and, as was the case, more than sixty years later—in 1916—they complained loudly against the increased price and the scarcity. Many of them felt compelled to raise their price or reduce the size of their papers. *The New York Tribune* reduced to its former size; *The New York Sun* reduced size; *The Philadelphia Evening Register* discontinued publication. At that time publishers of *The New York Times* protested that it was costing them sixty thousand dollars a year for paper, and *The New York Journal of Commerce* was paying from forty thousand dollars to fifty thousand dollars a year.

Naturally the rise in prices attracted fresh capital into the business. New mills and big mills were built and the old mills were expanded; for a time even they were run night and day, a custom that had not before been known. Soon business was overdone, the market was overstocked, and a feverish competition set in that sent prices tumbling down below the point of profit. Often actual loss resulted and not a few mills were compelled to close. The situa-

tion became serious and various plans were proposed to meet it. Manufacturers of fine writing met in Pittsfield, Mass., in February, 1861, representatives of twenty-one of the thirty-six mills in the country being present. A protective association was formed and it was decided that for three months from the first of March production should be curtailed one-third. But the firing upon Fort Sumter in April changed everything in the twinkling of an eye. From that time on prices went up and up, and the mills had plenty to do.

Early in 1862 ordinary printing paper was selling for nine cents and eight cents net cash a pound. Manufacturers agreed to increase the price, with the result that news went to seventeen cents cash and twenty-two cents before the end of the year. Manufacturers of fine writing took similar action and raised prices from thirteen and fourteen cents to seventeen cents for fine writing and from fifteen to twenty-five cents for letter and note paper. Within a few months all writing papers were forty cents a pound and No. 1 printing thirty cents. In 1864 news was selling for twenty-eight cents and fine book for forty-five cents. Presently news fell off eight cents a pound and some contracts were made at eighteen cents, a price that was considered heart-breakingly low. But compare that with 1916 prices for news. Then Congress was memorialized to remove the duty on paper. And how much that sounds like 1916. Stock was scarce. Waste paper commanded eight cents a pound and thousands of tons of old books and newspapers, school and account books, correspondence and business papers went to the mills. And still the price of white paper kept well up.

In 1863 William Platner, of Platner & Porter, of Unionville, Conn., drew up a carefully itemized estimate of the cost of running a mill to make eighteen hundred pounds of writing paper a day. The total was $528.26, and from this it appeared that the average cost of paper at the mill at that time was twenty-nine and one-half cents per pound, while the paper was bringing from forty to fifty cents.[284]

[284] *The Paper Trade Journal*, October 16, 1897, p. 114.

Prices in New York for January, 1865, according to a list then published, were:

Note paper, first class	55 to 60 cents
Note paper, good	50 to 55 "
Note paper, common	45 to 50 "
Letters and foolscaps, first class	50 to 55 "
Letters and foolscaps, second class	45 to 50 "
Letters and foolscaps, common	40 to 45 "
Flat caps and folios, first class	45 to 48 "
Flat caps and folios, second class	40 to 44 "
Flat caps and folios, common	35 to 40 "
Common news, straw, etc	20 to 22 "
Good news, rag	22 to 25 "
Fair white book	25 to 28 "
Extra book	28 to 32 "
Sized and calendered book	30 to 33 "
Extra sized and calendered book	35 to 40 "
Manilla wrapping	18 to 20 "

In 1866 fine book paper, which could have been bought before the war for sixteen cents a pound on six months' time, had risen to forty cents cash. Publishing houses of New York and Boston bought in the European markets because they could save twenty-five per cent. The Harper Brothers imported from Belgium and Ticknor & Fields, of Boston, from England.

A card issued in 1867 gave ream prices as follows:

14	lb. cap	$6.30	$5.95
12	" cap and letter	5.40	5.10
10	" cap and letter	4.50	4.25
9	" letter	4.05	3.83½
8	" letter	3.60	3.40
7	" letter	3.15	2.97½
6	" note and bath	3.00	2.85
5	" note and bath	2.50	2.37½
4	" note and bath	2.00	1.90
5	" octavo	2.75	2.62½
3¼	" octavo	2.11	2.03
2¼	" billet	1.52	1.46

CHAPTER FOURTEEN

MODERN EXPANSION

MILLS INCREASED IN NUMBER AND IN SIZE IN ALL PARTS OF THE UNITED STATES—MACHINERY EXPANSION—THE RISE OF BIG CORPORATIONS—NEW MEN, NEW METHODS AND NEW ACCOMPLISHMENTS—GROWTH OF FOREIGN TRADE—EXPORTING IS BEGUN IN COMPETITION FOR THE MARKETS OF THE WORLD

IN contemporaneous times several things stand out conspicuously in the history of the paper industry. During the closing years of the last and the opening years of the present century there was remarkable expansion in many ways. Bigger mills were built, bigger and better machinery put into them and improved methods of manufacture introduced. The industry was established in new places and, more than ever before, was concentrated in particular localities on large scale.

By the perfecting of the wood-pulp processes, an overwhelming increase in output resulted and a corresponding demand for paper was developed. Also wood-pulp made possible the multiplying of the kinds of paper and the manufactures therefrom to an extent that could not have been imagined a half century before. Pulp-making became almost an independent branch of the industry, expanding into a business of great dimensions and serving many lines of manufacture quite aside from that of purely paper making. Foreign trade began to be a matter for serious consideration. Exports, which in the past had been almost negligible, assumed encouraging proportions.

A clear idea of the steady and substantial growth of the industry in the years immediately following the close of

the civil war is exhibited in statistics that may be drawn from the various census reports of the United States, from *Lockwood's Directory* and from *The Paper Trade Journal*. Census statistics are more or less confusing and unsatisfactory. Work in the census bureau has never been standardized and its results are only approximately correct. Each successive director of the census has his own ideas, different from his predecessors, how the work should be done, and therefore in many particulars it is difficult and sometimes impossible to make dependable comparisons of one period with another by using those figures. Several examples will suffice so far as the paper industry is concerned. Before wood-pulp was known all census statistics related, of course, solely to paper-mills. In the censuses of 1870, 1880 and 1890 the wood-pulp mills were reported separately. In 1900 and 1910 paper and wood-pulp were combined in the returns. Sometimes manufactures, as paper-boxes and the like, are included as paper-mills and sometimes not. In recent censuses it has been the custom to enumerate establishments instead of the individual mills where several mills are in one plant under one corporate or firm ownership. Therefore the census fails to give the actual number of mills. With due allowances, however, the statistics are unquestionably valuable.

In the years between 1860 and 1870, especially in the latter part of that decade, considerable development took place in the value of production with only a small addition to the number of mills. According to the census of 1870, six hundred and seventy-seven mills existing in 1869, had a capital of $34,556,014, employed 17,910 persons and annually produced paper to the value of $48,849,285. The mills were in thirty-one states and the District of Columbia; New York, Pennsylvania, Massachusetts and Connecticut still predominating, with four hundred and thirty-two mills, and $35,861,791 value of production. Ohio came fifth in rank with forty-four mills and annual production of $4,010,483.

During the next ten years the number of establishments increased to seven hundred and forty-two, with capital $48,139,652, number of employees 25,631, and value of

product $57,366,860. These mills were in twenty-nine states and the District of Columbia. Out of the total number New York, Massachusetts, Pennsylvania and Connecticut, in the order named, had the largest number, four hundred and seven, with annual production of $33,405,937. Ohio came next with sixty mills and production value of $5,108,194. The total daily capacity in tons for 1881 was: all kinds of paper, 2,266, chemical fibre, 1,297, ground wood, 3,844. For 1897-8, the totals in tons were: paper 6,675, chemical fibre, 1,725, ground wood, 3,225.

In 1890 there was, by the census returns, a drop in the number of establishments reported, to six hundred and forty-nine in thirty-one states and territories. But, in a lesser number of mills than in 1870, more capital was invested, more people were employed and the value of product was larger, the figures being: capital, $89,829,540; employees, 31,050; product, $78,937,184. This showed expansion of the business as a whole and a greater expansion in the average per individual establishment. The bulk of the industry was in New York, Massachusetts, Pennsylvania and Ohio in the order named, with three hundred and thirty-five establishments and annual product $49,767,674. Connecticut came fifth in the list with forty-two mills and annual product of $3,556,257. Oregon and West Virginia each had two establishments and Kansas, Kentucky, Minnesota, Missouri and Utah one each.

In the census of 1900, seven hundred and sixty-three establishments, reported for 1899, had a capital of $167,507,713, wage earners, 49,646, and value of annual product, $127,326,162, an increase of nearly eighty-seven per cent. in capital invested and over sixty per cent. in value of annual product since 1889. At the same time twenty-nine establishments, having capital of $4,326,629, were reported idle. News-print in rolls amounted to 455,000 tons, valued at $15,775,000, the average cost being $34.62½ and selling price $50 to $60 per ton. Book-paper amounted to 282,000 tons, valued at $19,467,000, the average cost at the mill being $69.03 per ton. Fine writing amounted to 90,000 tons, valued at $12,223,000, the average cost per ton at the mill being $135.81. Other figures were:

manilla wrapping, 89,000 tons, value, $5,930,000; heavy wrapping, 83,000 tons, value, $4,143,000; straw wrapping, 92,000 tons, value, $2,028,000; bogus wood manilla, 204,000 tons, value, $9,149,000.

Foreign trade assumed larger propertions in this period than ever before. We had been importers of paper and its manufactures from the colonial and early republic time, the amount and the value of such importations showing many fluctuations, year by year, but generally on the increase. Rags and other paper stock had always been imported from the time that domestic mills, in their needs, had outgrown the domestic supplies in raw materials. Now our imports of stock were keeping up and also our imports of paper and its manufactures, while our exports were beginning to show more strength.

In 1848 we exported to the value of $78,507 while import values were $415,668. In 1852 exports were valued at $119,535 and in the following year at $122,212. During the civil war and for several years after, paper imports amounted to from one to three million dollars annually. But soon this large importation began to fall off. Cheap news and book-paper, which we had been buying in Belgium, ceased to find a market here and so also with the writings, ledger and fancy papers from England and France. Our heaviest importations in this later period were to the value of $1,580,117 in 1871 and in 1877, $1,200,103. After 1877 imports in several years were to the following values: 1879, $1,186,382; 1880, $1,671,120; 1882, $2,034,289, with slight falling off in the next five years; 1888, $2,400,790; 1893, $3,880,981, with slight falling off in the next six years.

Until after the civil war our exports of paper were nearly negligible in quantity and in value, and in the immediately subsequent years they crawled up very slowly and with occasional set-back. Beginning in 1870 values of our exports in several years thereafter were: 1870, $514,592; 1879, $1,117,677; 1880, $1,201,143; 1881, $1,408,976, considered to be exceptionally large; 1884, $929,821; 1885, $972,493, with a steady annual increase afterward. In 1890 our exports were in value $1,226,686, of which

amount $234,501 was to England, $181,800 to Cuba, $89,540 to Canada, $78,319 to Australia and $74,640 to Mexico. During the next ten years these values steadily increased each successive year except in 1899 when there was the immaterial falling away of $16,680.

Imports of paper and its manufactures, in 1900, not including books, maps and other printed matter, were to the value of $3,795,645. From that point the increase was regular every year until, in 1908, the amount was $12,223,058. In 1909 there was a falling-off to $11,632,571 which was followed by slight decreases in each year thereafter until, in 1915, the figures were $10,317,211. In 1909 imports of printing-paper were to the value of $903,705. There were small increases in 1910, 1911 and 1912, and then, in 1913, the figures jumped to $6,034,023, in 1914, to $11,075,659 and in 1915 to $13,119,912.

Imports of paper stock, including rags, amounted in value, in 1900, to $3,261,778. After a decrease to $2,183,686, in 1901, there was a gradual rise, year by year, until, in 1907, came the figure of $5,580,528. In 1908 there was a drop to $3,675,926, and, in 1909, to $3,638,034. In 1900 the imports advanced to $5,206,877, increasing each year thereafter until, in 1914, the values of $8,571,207 were reached. Then, in 1915, the effect of the European war was shown in a fall of nearly fifty per cent in these imports, the drop being to $4,817,583. Foregoing figures do not include wood-pulp. Imports of wood-pulp, in 1900, were to the value of $2,405,630, and increased to $4,500,955 in 1905, $6,348,857, in 1907, $8,629,263 in 1908, $11,768,014 in 1909, $13,980,357 in 1911, $16,165,316 in 1913 and $19,881,111 in 1915. Pulp-wood was imported in 1907 to the value of $2,792,751, in 1910, $6,392,023, in 1913, $6,954,952, in 1914, $7,245,466 and in 1915, $6,572,839.

During the ten years from 1900 to 1909, each inclusive, we exported paper and its manufactures, exclusive of books, maps and other printed matter, to annual amounts as follows: $5,477,884; $6,215,833; $7,438,901; $7,312,030; $7,180,014; $7,543,728; $8,238,088; $9,536,065; $9,856,733; $8,064,706; $7,663,139. Printing-paper was exported in 1900 to the value of $2,521,320. In the subse-

quent ten years those figures did not materially change, being the highest, $3,489,589, in 1901, the lowest, $2,140,582, in 1908, and, in 1910, $2,766,659. In 1911 the figures rose to $3,689,553, in 1913 to $4,057,219, in 1915 to $4,669,009. Writing-paper and envelopes rose in value of exports from $463,248 in 1900 to $975,099 in 1905, $1,200,742 in 1907, $1,351,226 in 1913 and then dropping to $1,179,232 in 1914 and $1,098,197 in 1915. Of the exports for 1914 Australia took the largest quantity of printing-paper, to the value of $947,185, with Argentina, second, to the value of $447,908. But in 1915 our best customer in this line was Argentina, to which country we sold to the value of $806,217; and Australia was second with value of $744,356. In 1916 we sold to Argentina to the value of $1,039,360, to Cuba, $376,011 and to Australia, $296,394. Sales of books, engravings, maps, music and other printed matter to Canada amounted to $4,905,329 in 1914; $4,123,068 in 1915 and $4,420,478 in 1916, being in each year nearly one-half of our total exports of that description.[239]

Long before 1900 was in sight modern machinery had been the prime factor in the industry, and modern mills as they were to be for a generation at least were fully established in character even if not yet in completest development. Looking at modern mills so well equipped with Fourdriniers and cylinders, it is not easy to understand the scepticism as to the efficiency of those machines and the possibilities inherent in them that existed for more than half a century after their appearance and that, indeed, continued even into contemporaneous times. Few persons then had dreamed of the increase in size and speed of running that was to come in a generation. In 1847 the machines used in the United States were almost insignificant in size compared with those that were to come after. When the Chelsea mill in Norwich, Conn., put in an eighty-four-inch machine it was considered a wonder.

Previous to 1867 the width of the widest machine was

[239] *Statistical Abstract of the United States,* Twenty-eighth Number, pp. 292, 300, 320. *Ditto,* Thirty-eighth Number, 1915, pp. 401-2 and 413-14, 444.

not more than one hundred inches and the maximum speed did not exceed one hundred feet per minute. At that time it was generally supposed that the limit of width and speed had been reached. In 1872 *The Paper Trade Reporter* of New York stated as a surprising fact that, while the ordinary speed of the Fourdrinier machine was from sixty to eighty feet per minute, on printing paper, there was then one machine running at the rate of one hundred and seventy-five feet per minute, producing twenty-five tons of paper weekly. Nevertheless paper-makers in Europe and in the United States still continued doubtful. Their views, as late as 1873, were accurately expressed by one writer:

> "If every part is constructed with the utmost care, substantially and true, a machine with a wire 33 feet in length and seven drying cylinders of 3 feet diameter, can make news-print paper at a speed of from 100 to 130 feet per minute. The width of the machines has also been increased until wires 86 inches wide are now quite numerous, and some of 90 inches and even 100 inches are in use."[234]

Not long after this, in 1880, a Fourdrinier was built for the mill of P. H. Glatfelter, in Spring Forge, Penn., that had a speed of two hundred feet per minute. From that time on the pace was steadily increased until, before 1897, machines one hundred and sixty inches wide had been built, an increase of sixty per cent. in thirty years. There were four mills equipped with machines capable of making merchantable news-paper continuously at five hundred feet per minute, an increase of four hundred per cent., in the thirty years that had elapsed since 1867. Those four were in the plants of the Glens Falls Paper Mill Company of Glens Falls, N. Y., the Hudson River Pulp and Paper Company of Palmer's Falls, N. Y., the Glen Manufacturing Company of Berlin, N. H., and the Willamette Pulp and Paper Company of Oregon City, Ore.[235] The largest ma-

[234] Carl Hoffman: *Treatise on the Manufacture of Paper* (1873), p. 193.

[235] T. H. Savery: *The Paper Machine.* In *The Paper Trade Journal,* October 16, 1897, p. 9.

chine then in the world—1897—was a Fourdrinier built by the Rice, Barton & Fales Machine and Iron Company for the Rumford Falls Paper Company of Rumford, Me. The felts for this machine were one hundred and seventy-two inches wide and the width of the paper run was one hundred and fifty-two inches. At that time, in striking contrast with this big machine, was the smallest machine in the world, which had been built by the Pusey & Jones Company of Wilmington, Del., for the Heller & Merz Company of Newark, N. J. The machine had one forming cylinder, fourteen inches diameter and fifteen inches face; one pair of press rolls, sixteen inches diameter and fourteen inches face, and three dryers, fifteen inches diameter and fourteen inches face.

Even then most manufacturers were slow in conceding the real value of the great machinery advance. Especially was this true across the Atlantic. An English writer in 1897 thought that he had reached the limit in extolling the accomplishment of the modern machine when he said that: "A modern machine will produce a piece of paper 300 to 400 feet long and 120 inches wide in one minute and will turn out about 55 tons of paper per week." Another writer about the same time, doubting the report that machines in the United States were running at five hundred feet per minute, said:

> "It may some day happen that the construction of paper machines will be so improved and the 'stuff' worked in such a way as to enable paper makers to work with advantage at this high speed; but I think I am right in saying that the general consensus of opinion is strongly against such high pressure for profitable work."[236]

It took less than twenty years for the Americans to confound those doubting Thomases with machines from one hundred and fifty to one hundred and eighty-six inches wide, and a speed of six hundred and thirty to six hundred and fifty feet a minute.

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[236] *Journal of the Society of Arts,* (1898), XLVI., p. 416.

There has been a steady increase in the number of machines in the mills of this country and their producing capacity ever since they were first introduced and especially in the present generation. In 1899 American mills had six hundred and sixty-three Fourdriniers and five hundred and sixty-nine cylinders; in 1904, seven hundred and fifty-two Fourdriniers and six hundred and seventeen cylinders; in 1909, eight hundred and four Fourdriniers and six hundred and seventy-six cylinders. The total annual tonnage capacity of these machines, in the same years, was: 2,782,219 in 1899; 3,857,903 in 1904; 5,293,397 in 1909. In following years the number of machines of both kinds and their capacity increased. The largest Fourdrinier in 1916 was in the Columbia mill of the Crown Willamette Paper Company at Camas, Washington, one hundred and eighty-six inches. In the mill of the Minnesota & Ontario Power Company, at International Falls, Minn., were two Fourdriniers, one hundred and eighty-four inches each; and the same company had also two one hundred and fifty-four-inch machines. Fourdriniers of one hundred and fifty inches upward were not uncommon and cylinders reached the size of one hundred and forty-two and one hundred and forty-five inches. Among the big plants of contemporaneous times, equipped with Fourdriniers, were: the Rumford Falls mill, nine, from seventy-eight to one hundred and fifty inches; the Otis mill, nine, from seventy-seven to one hundred and forty-one inches; the Oxford mill, ten, from seventy-eight to one hundred and forty-two inches; the West Virginia Pulp and Paper mill in Maryland, seven, from ninety-two to one hundred and fifty-two inches; the eight mills of Crocker, Burbank & Co., in Fitchburg, Mass., fourteen, from seventy-two to one hundred and fifty-six inches; the mill of the New York and Pennsylvania Company in Johnsonburg, Penn., eight, from ninety-six to one hundred and fifty-eight inches; the Great Northern Millinocket mill in Maine, eight of one hundred and fifty-two inches and one of one hundred and fifty-eight inches; the Columbia mill of the Crown Willamette Paper Company in Camas, Washington, six from eighty-four to one hundred and thirty-six inches, one of

one hundred and fifty-two inches and one of one hundred and eighty-six inches; the Cumberland mills of S. D. Warren & Co., twelve, from fifty-six to one hundred and forty-five inches.[287] And in Canada they had reached the width of over two hundred inches and were talking of more; but that has nothing to do with the history of the mills on this side of the border.

While prices had sailed skyward from 1861 to 1865 they declined at rapid rate from 1865 to 1880: superfine writing folded, fifty-eight per cent.; machine-finished book, fifty-three per cent.; super-calendered book; fifty per cent. Some scattering figures of prices that prevailed during the third of a century after 1870 will give something of an idea of the conditions of the market in those times. In 1871 superfine book was selling in the eastern markets for twenty to twenty-four cents a pound and in Chicago and Cincinnati for sixteen to eighteen cents. Fine book was selling for sixteen to seventeen cents, straw paper for newspapers for twelve cents and straw-wrapping for four and one-half and five cents. News print was selling at various centers, in 1875, for nine cents, superfine calendered book for thirteen to fourteen and one-half cents and machine finish book for ten to eleven cents. In 1895 prices were: news, two and three-eighths to two and three-fourths cents; super, four and three-fourths to five and one-half cents and machine finish four to four and one-half cents, a steady fall, year by year, for the twenty years. In 1889 writing ranged from fourteen and seventeen cents for superfine to seven and one-half and nine cents for engine sized. Super and calendered book commanded six and one-half and seven and one-half cents. News, not under contract, was three and one-fourth cents and upward.

Abnormal conditions in the world in 1899 affected the paper industry in this country. The Spanish-American war, the Boer war and other affairs stimulated newspaper reading so that the demand for news print rose, mills were pushed and prices went up. News which, in the preceding few years had tended to fall in price, went up again to

[287] *Lockwood's Directory for* 1897.

three cents and more. The American Writing Paper Company advanced prices. Book paper prices in all grades went up, super to five and one-half and six and one-half cents. Manilla, tissue, board and all other kinds joined in the rising. Prices were not long maintained at the figures of that time. A year later the average price for all paper used in newspapers and periodicals was down to 2.57 cents per pound; news in rolls was 1.7 cents, news in sheets, 1.89 cents, and wood-fibre book 3.45 cents. With fluctuations of minor character these low prices were maintained for the next dozen years.

Paper-trade journalism began in 1872 when Howard Lockwood published the first number of *The Paper Trade Journal*. A few years previous, *The Paper Trade Reporter* was published but it was a small affair and did not long endure. Mr. Lockwood was a young man who had been in the trade only a few years when he conceived the idea of a newspaper devoted to its interests. He was not a newspaper man but he had a natural instinct for news-gathering, a genius for publishing, a good knowledge of the trade in paper and acquaintance with the processes of its manufacture. Independent, fair, honest, and enterprising from the outset, aiming only to print all the news and to serve the interests of the industry in every conceivable legitimate manner, Mr. Lockwood was immediately successful and his paper soon became a power for good. In 1873 he began the publication of *Lockwood's Directory of the Paper and Stationery Trades;* in 1875 *The American Stationer* and in 1885 *The American Bookmaker,* afterward *The Printer and Bookmaker.* In addition to these periodicals he published books relating to the industry such as *The Chemistry of Paper Making* and *The Dictionary of Printing and Book Making.* He died in the prime of life, in 1892, but he had lived to see his publications firmly established in the foremost ranks of trade journalism in the United States. In subsequent years there were other periodicals in the field notably *The American Paper Trade and Wood Pulp News, The Paper Mill* and several times *Paper.*

Contributing much to a general advancement and broad

HOWARD LOCKWOOD.
Founder of the PAPER TRADE JOURNAL.

development of the industry has been influence emanating from various associations established among those active in the trade. First of these was the American Paper Manufacturers' Association which grew out of a convention held in 1878 and which presently became the American Paper and Pulp Association. With an initial purpose for co-operation to control the market and stabilize prices. the association shortly took on social in place of the business character that had first informed it and exercised influence by the interchange of views among its members, on condi-

tions and problems of the industry. The membership of the association, 1878-1916, included practically all the leading men in the industry. Among its presidents during that period were William Whiting, Wellington Smith, William H. Parsons, Byron Weston, William A. Russell, Warner Miller, Augustus G. Paine, George F. Perkins, Hugh J. Chisholm, P. C. Cheney, Arthur C. Hastings, A. B. Daniels and George W. Knowlton. Other associations in different branches of the trade have been active and influential in New York, Boston, Baltimore, Philadelphia, the Miami Valley of Ohio, central New York State, western Pennsylvania, the Pacific coast and the northwest section. Of late origin and of more business character was the News Print Manufacturers' Association, formed to conserve the interests of the manufacturers of newsprint. Under the management of George F. Steele a great deal of remarkable service was done, statistical and

GEORGE F. STEELE.

otherwise for this particular branch of the industry.

Importance of advanced technic in paper-making was recognized in this new era more than ever before. The pursuit became more thoroughly scientific—a profession rather than a trade. Technical knowledge and experience were demanded in men who would undertake the work of making paper and developing the industry. To this end schools for instruction were started to supplement practical labor in the mills. The first collegiate institution to move in this direction was the University of Maine, at Orono, which, in 1912, began lectures and laboratory courses on the making of pulp and paper, and on forestry in connection therewith. A small paper-plant was installed in 1914. Students also had opportunity to learn from actual experience in mills and in lumber camps.

In 1912 the United States government established in the University of Wisconsin, at Madison, a forest products laboratory, consisting of a paper-mill, with two beating and one refining engine, and a pulp-mill, with a wet machine, a soda-digester, sulphite-digester and two grinders. The plant was for experimenting with and testing the commercial value of different fibres for paper-making. In 1910 a laboratory equipped with grinder, barker, wet machine and other machinery was established at Wausau, Wis., to experiment and study ground-wood problems.

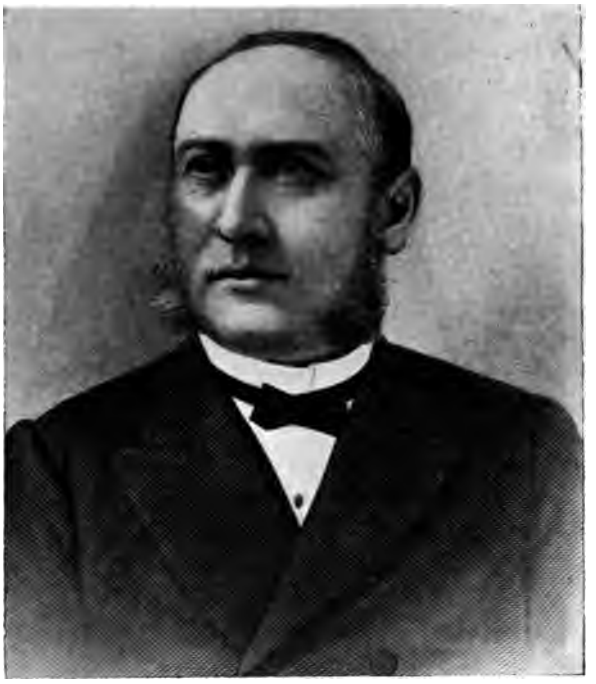
In 1916 the Massachusetts Institute of Technology developed a plan to give practical instruction to its advanced students in applied chemistry as related to manufacturing interests. In the field of pulp and paper-making the Institute selected, as a station for this purpose, the plant of the the Eastern Manufacturing Company, South Brewer, Me. Arrangements were made for a laboratory building and a course of instruction in all the various processes of manufacturing pulp from wood and rags and perfecting it for paper-stock; and as an outgrowth of this it was proposed ultimately to establish a research organization. And to these institutional enterprises must be added private experimental establishments like the Arthur D. Little of Boston, and the increasing experimenting of individual workers in the mills everywhere.

Before 1880 hand-made paper had nearly disappeared as an American product, machinery having driven it out of existence. The last to abandon the old method was the Willcox mill in Pennsylvania, the mill of the L. L. Brown Paper Company in Adams, Mass., and the mill of the Seymour Paper Company in Windsor Locks, Conn. In 1897 the Brown mill was the only one left, but there that kind of work ceased in 1906. In England, in 1914, fourteen firms were producing hand-made paper.

In the closing years of the nineteenth century came the movement toward the concentration of capital in all branches of industry which made that period most notable in the financial and political history of the country. During the years 1897, 1898 and for a decade thereafter, the movement showed a development that commanded the attention of the world and that wholly changed the character of American industry. In the field of paper-manufacturing, as well as elsewhere, this tendency became manifest. Capital invested therein increased tremendously and as such corporations as the United States Steel and others of that ilk came into existence, it naturally followed those examples, seeking the opportunity afforded by consolidation in corporate form, for advantageous employment.

Disposition had long existed toward loose gentlemen's agreements, so-called, in nearly all branches of the industry. The futility of such attempts to restrict production when restriction was considered necessary to control amount and distribution of output and to maintain prices was demonstrated again and again. Out of these failures came a few successful attempts at co-operation and consolidation, but more efforts that were in the end abortive. Several of the large corporations that became and remained conspicuous and influential in the industry date from that time and were the outgrowth of the investment influences then being exercised.

The International Paper Company became the conspicuous success of this consolidation movement. Incorporated in 1898 the company acquired many of the most important mills manufacturing news in the eastern states and gradually added other paper and pulp mills, wood lands and



WILLIAM A. RUSSELL.

water power to its possessions. With a capital stock of $25,000,000 preferred and $20,000,000 common and a bonded mortgage of $10,000,000, its assets in 1900-01 were, mill plants $41,586,964, and wood lands and other property $4,101,723: these values increasing in subsequent years. The company then owned thirty-four mill plants, water-powers and wood lands in Maine, New Hampshire, Vermont, Massachusetts, New York and Ontario and had controlling interests in the Continental Paper Bag Company, the St. Maurice Lumber Company, the American Realty Company, the American Sulphite Company, the Winnipiseogee Lake Cotton and Woollen Company and the Michigan Pulp Wood Company. The organizing president of the company was Alonzo N. Burbank and the first active president William A. Russell, who served until his death in 1899 and was succeeded by Hugh J. Chisholm

who held the office for many years and was the controlling power in the company. Among other prominent paper men active in its management during the first eighteen years of its existence were Warren Curtis, Frederick H. Parks and Albrecht Pagenstecker. Mr. Burbank was again president in 1907 and after.

In 1916, with Philip T. Dodge as president, the company owned and operated thirty-one mills. In New York were the Glens Falls, Fort Edward, Hudson River, Niagara Falls, Curtis, Lake George, Piercefield, Cadyville, Watertown and Woods Falls; in Maine the Otis, Rumford Falls, Webster, Livermore, Solon, Riley and West Enfield; in New Hampshire the Glen and the Winnipiseogee; in Massachusetts the Montague; in Vermont the Fall Mountain, Wilder and Milton. All these plants had mills for producing ground-wood pulp, their total daily capacity being one thousand five hundred and seven tons. With the exception of the Curtis, Livermore, Solon, Cadyville, Riley, West Enfield and Milton, all had paper mills, with total daily capacity of one thousand seven hundred and twenty-seven tons. Nine of them had sulphite in addition to paper and ground-wood mills, their daily capacity being five hundred and seventeen tons, the Rumford Falls mill with a daily capacity of one hundred and twenty tons being the largest.

The American Writing Paper Company was incorporated in New Jersey with a capital stock of $25,000,000 and organized with Elisha Morgan of Springfield, Mass., as president. The company took over the mills of these concerns: Beebe & Holbrook Paper Company, Chester Paper Company, Massasoit Paper Company, Esleeck Paper Company, Hurlbut Manufacturing Company, Crocker Manufacturing Company, Oakland Paper Company, Springdale Paper Company, Parsons Paper Company, Norman Paper Company, Platner & Porter Paper Manufacturing Company, Windsor Paper Company, Linden Paper Company, Nonotuck Paper Company, Harding Paper Company, Holyoke Paper Company, Dickinson Paper Company, Riverside Paper Company, Shattuck & Babcock Company, Albion Paper Company, Syms & Dudley

ARTHUR C. HASTINGS.

Paper Company, George C. Gill Paper Company, Connecticut River Paper Company, Agawam Paper Company, Eaton, May & Robbins Paper Company, George K. Baird Paper Company, Wauregan Paper Company and the plant of the Hurlbut Stationery Company. The company down to 1916, when Arthur C. Hastings had been president for several years, had done, from its start, an annual business of about $12,000,000. Twenty-two mills were then owned and operated by the company. The total capacity of these mills was 828,500 pounds daily.

For upward of twenty-five years the straw-board interests have been the subject of more attention from financiers, promoters, pooling agents and speculators than any other single branch of the paper industry. A volume would be required to rehearse in detail all the history in these various movements for control or manipulation in the straw field. Before 1890 pooling arrangements were

entered into by many of the mill owners and prices went up and then down as the pool or its competitors might be dominant, but after a time these were abandoned. In 1889 the Union Straw Board was in control of ninety per cent of the mills, but the same year it was succeeded by the American Straw Board Company which, with a

O. C. BARBER.

capital of $6,000,000, was powerful in the market. Prices came down to $35 and $32 a ton, but soon went up again. In January, 1892, the American Straw Board Company and the independents came to an agreement on prices at $40@$32.50, but the compact was soon broken. At that time the daily product of the country was seven hundred and fifty tons and the daily consumption four hundred and fifty tons.

In 1897 the American Straw Board Company and the Standard Straw Board Company, a selling organization, were in the field in agreement to control, but outside mills broke prices. The Standard retired but the Straw Board Manufacturers' Association came in to do what the other had failed to accomplish; but its success was merely a temporary flash. In the first months of 1901 the independent mills organized the Manufacturers' Straw Board Company as their selling agency and began cutting prices. During that year prices fluttered around $20.50 and $32.50. The foregoing gives but the merest suggestion of the kaleidoscopic activities in the field of straw-board manufacturing in this generation. Through it all the American Straw Board Company maintained its existence in varied experience and changing control.

In 1916 the company owned thirteen mills, six of which were in Ohio, in Barberton, Circleville, Dayton, Piqua, Tiffin and Tippecanoe City; three were in Illinois, in Lockport, Quincy and Wilmington; and one each in Chestertown, Md.; Winchester, Va.; Norwich, Conn., and Noblesville, Ind. Nine mills were in operation with daily capacity of four hundred and seventy-four tons. The president of the company was then O. C. Barber who was one of its founders in 1889 and its first president. Mr. Barber was active in the straw board business as far back as 1874 when he built the mill of the Akron, Ohio, Straw Board Company. He also built the Wabash paper-mill and the mill of the American Straw Board Company at Circleville in 1882.

This movement toward big corporations extended well over into the twentieth century before it settled down fixedly into a permanent condition. From 1900 on, for ten years or more, was a period particularly of strenuous and sometimes exciting effort in that direction. Other substantial corporations, that were destined to become prominent and influential in the industry, had their beginnings then. They were combinations controlling many heretofore individual enterprises or they were single properties expanding to meet the demands of the time.

The United Box Board and Paper Company, in 1902,

took over mills operated by twenty-eight companies and firms making straw, news and other boards. Five years later, after prolonged internal disagreements between the stockholders and the management, most of the mills went back to the original owners. In 1908, out of a receivership, the company was reorganized as the United Boxboard Company. Out of this came, in 1912, the United Paperboard Company, Sidney Mitchell president, with capital stock of $14,100,000. In 1916 the company owned and operated eleven paper-board mills, daily capacity three hundred and seventy two tons, in Benton Falls and Fairfield, Me., Whippany, N. J., Urbana, Ohio, Peoria and Mt. Carmel, Ill., Rockport, Wabash and West Muncie, Ind., Lockport and Schuylerville, N. Y.; six ground-wood mills, daily capacity ninety-three tons, in Benton Falls, Fairfield, Schuylerville, Lockport and West Muncie; one soda-mill, daily capacity thirty tons, in Fairfield, and one sulphite-mill, daily capacity thirty tons, in Lockport.

The Union Bag and Paper Company was organized in 1910, for the purpose of taking over the then-existing Union Bag and Paper Company, the Consolidated S. O. S. Bag Company, the Van Nortwick paper and bag interests and several mills in New York. The capital stock was $27,000,000, and there was an authorized bond issue of $5,000,000. The properties of the company consisted of three paper-mills, in Hudson Falls, N. Y., and one each in Ballston Spa, N. Y., and Kaukauna, Wis.; four ground-wood mills in Hudson Falls, and one each in Ballston Spa, Hadley, N. Y., and Kaukauna; one sulphite mill in Hudson Falls. In 1916 the office of president of the company was vacant and August Heckscher as chairman of the board of directors exercised general direction of its affairs. The company was then operating, in Hudson Falls and Kaukauna, ten mills with daily capacity of two hundred and fifteen tons of paper, fifty-nine tons of ground-wood and one hundred and forty tons of sulphite-fibre. It also operated bag factories in Hudson Falls, Kaukauna and Chicago and controlled a subsidiary company in Canada, the St. Maurice Paper Company.

The Continental Paper Bag Company was organized with preferred stock of $2,500,000 and common stock of $2,500,000. In 1916 the company, Herman Elsas, president, owned the Watertown mill in Watertown, N. Y., the Ashland in Ashland, N. H., and the Greenwich in Greenwich, N. Y., the daily capacity of these mills being thirty tons of tissue and eight tons of ground-wood. In addition the company owned a bag factory in Rumford, Me.

JOHN G. LUKE.

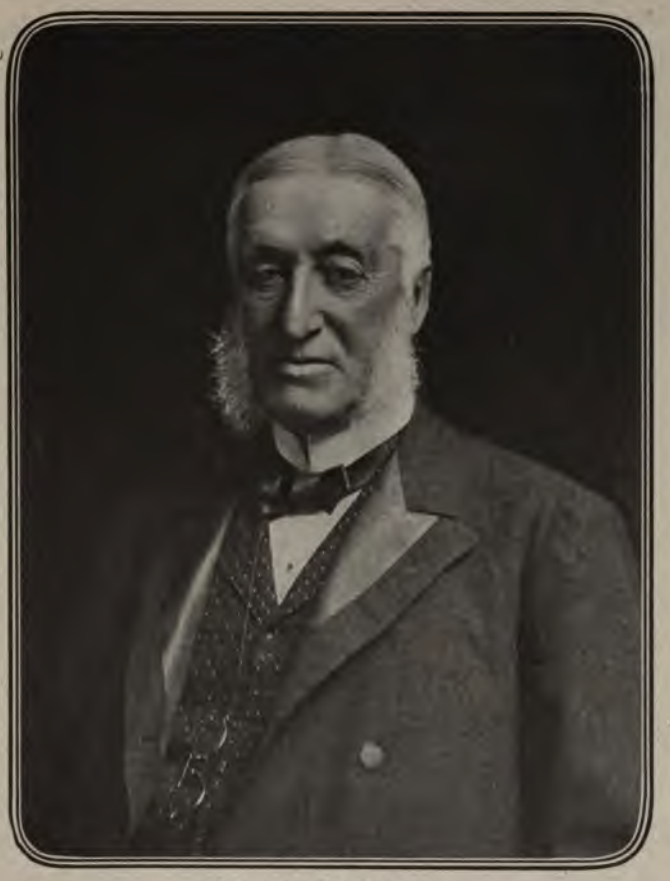
The Great Northern Paper Company came into being, in 1899, with capital of $4,000,000 and built the big modern Millinocket mill in Maine. Among its owners were Oliver H. Payne, Augustus G. Paine, and Garrett Schenck. The company acquired 260,000 acres of timber land and subsequently added other paper and pulp mills to its property. In 1916, besides its original ten-machine news-mill, of three hundred and twenty tons daily capacity, it had a

news-mill in East Millinocket, of one hundred and eighty tons daily capacity, a news and bag paper-mill in Madison, Me., of sixty tons daily capacity, and three pulp-mills, with daily capacity of six hundred and ten tons of ground wood, and sulphite fibre.

The West Virginia Pulp and Paper Company, already a large and flourishing concern under the presidency of John G. Luke, was reincorporated, in 1899, and consolidated the property of the Morrison and Case Paper Company in Tyrone, Penn., with that which it owned in West Virginia. By 1916 the company had further expanded in five states, New York, Pennsylvania, Maryland, Virginia and West Virginia, having five paper-mills with daily capacity of four hundred and fifty tons of book, writing and other papers; four soda-pulp mills with daily capacity of two hundred tons, and three sulphite-fibre mills with daily capacity of one hundred and seventy tons.

Among other large corporations that came into being after 1900 were: the St. Croix Paper Company, $2,500,000, the Finch, Pruyn & Co., $3,000,000; the consolidation of the Columbia River Paper Company and the Crown Paper Company as the Crown-Columbia Pulp and Paper Company, $1,000,000; the Champion Fibre Company to build a pulp mill in North Carolina, $1,000,000; the consolidation of the Bryant Paper Company, the Imperial Coating Mills and the Superior Paper Company into the Bryant Paper Company, of Kalamazoo, Mich.; the consolidation of the Tytus Paper Company, the Gardner Paper Company and the Middletown Paper Bag Company into the Tytus-Gardner Manufacturing Company, $1,000,000; the consolidation of the Nekoosa Paper Company, the John Edwards Manufacturing Company and the Port Edwards Fibre Company into the Nekoosa-Edwards Company, $3,000,000. The Bryant Paper Company, with a capital of $3,000,000 which was increased to $6,500,000, in 1916, became the largest producing mill in the world, of book-paper.

Instances like the foregoing might be multiplied but sufficient have been noted to show the trend of things. The industry grew as it had never grown before in any other



WILLIAM H. PARSONS.

period of its existence. Scores of concerns were incorporated with capitalizations ranging from half a million to several million dollars, while others, already well-established, increased capitalizations in similar figures. Million dollar corporations became almost commonplace to paper-manufacturers. In 1912 nineteen new paper and pulp enterprises were inaugurated with a capitalization of $15,240,000. In addition there were incorporated nine companies dealing in lumber products and pulp-wood lands, with capital of $4,130,000. That was a fair example of what was taking place, in this decade.

In this era of business expansion, when "trusts" had everywhere become the order of the day, discussion of combinations reached, at times, a state of feverish excitement among paper-manufacturers. A great deal of this discussion did not get much beyond the speculative and spectacular stage, but presently the field of paper learned to know the promoter. Nearly all branches of the industry were exploited and sometimes disastrously. One figure that loomed large, in this period, was that of John H. Parks whose ambitious plans, best known as the "Parks' pooling," commanded attention more by what was proposed to be done under them than by any final success achieved thereby. Most of the Parks' Pool organizations, as they were called, fell under the disapproval of the United States government which made short work of them. The individual official members were indicted, under the Sherman anti-trust law, for actions in restraint of trade. Generally they pleaded guilty and were fined $2,000 each, and their association was dissolved. Thus went by the Fibre and Manila Associations, 1908; the American Paper Board Association, in 1910; the Eastern Box Board Association, in 1911; the General Paper Company, a Chicago selling agency for Wisconsin mills, in 1905; the box-board makers in 1905, and others.

Other combinations that appeared about this time, with ambition to absorb and control, did not last long. The Columbian Straw Paper Company, with a capital stock of $4,000,000, tried to take in the straw-wrapping mills. Begun in 1892, it was brought to an end in 1895 under foreclosure proceedings. The National Wall Paper Company endured a few years and was then absorbed by the Continental Wall Paper Company which eventually went the way of its predecessors. For some time interest among the pulp-board men was centered around the National Wood Board Company, and then the National Board and Paper Company, and then the National Pulp Board Company, and then the National News Board Company; and from time to time the Paper Products Company, the Western Box Board Company and others; but all were soon only memories. In 1901 the White Mountain Paper Com-

pany was incorporated with capital stock of $15,000,000 and began the construction of a paper and pulp plant in Portsmouth, N. H. The company failed before it really began; in 1903 a receiver was appointed and the company declared bankrupt. The property was sold in 1905 to the Publishers Paper Company organized with capital of $6,000,000, but that was out of existence a few years later.

The Manufacturers Investment Company started in with a sulphite mill in Appleton, Wis., in 1891, and a mill in Madison, Me., but lasted only a few years. In 1899 it went under the hammer at a receiver's sale, the Wisconsin property being acquired by the Interlake Pulp and Paper Company which had a ground-wood mill also, while the mill in Madison was bought by the Great Northern Paper Company. The Union Waxed and Parchment Paper Company was organized with a capital of $1,800,000. It purchased several mills but later consolidated its business in the Climax mills, in Hamburg, N. J., where it permanently remained. In August, 1892, the United Paper Company was incorporated, its purpose being well indicated by the name under which it was popularly known, "The Tissue Paper Trust." Charles F. Gunckel was the president. In New York, New Jersey and Ohio, twelve mills were purchased and paid for in stock of the corporation. Control of the tissue market was assured and prices began to mount. Then owners of straw-wrapping mills saw the opportunity and turned to tissue. The market was broken and, in nine months from its start, the company went into the hands of a receiver, being finally resolved into its constituent elements. Another ambitious enterprise of the period was the Singerly Pulp and Paper Company, organized in 1890 by William M. Singerly, owner of *The Philadelphia Record,* with a capital of half a million dollars. Mr. Singerly built a mill in Elkton, Md., and went along for eight years. Then, in the stupendous financial crash of all the Singerly interests, banking, publishing and manufacturing, in 1898, the mill was ruined with the rest and passed into other hands.

CHAPTER FIFTEEN

INTO THE TWENTIETH CENTURY

LATEST CENSUS FIGURES—A WOOD-PULP ISSUE WITH CANADA—EXPORTS FROM THE DOMINION INCREASED—THE GREAT EUROPEAN WAR AND ITS EFFECTS—SCARCITY OF PAPER STOCK AND OTHER MATERIALS—A PAPER-FAMINE WITH RISING PRICES—A SECTIONAL AND STATE REVIEW OF THE INDUSTRY

DURING the first decade and a half of the twentieth century there was further growth of the industry. A mid-period census gave the number establishments in 1904, as seven hundred and sixty-one, capital, $277,444,471, product value, $188,715,189, wage earners, 65,964. The increase of two hundred and six in number of establishments from 1860 to 1905, does not seem large. To a considerable extent this is accounted for by the concentration into large establishments thus reducing the increase in number. An exhibit showing the average amount of capital invested and the average value of products per establishment at each census, beginning with 1860 and ending in 1905, demonstrates this. The figures of average capital in those periods were successively: $25,320, $51,043, $64,878, $138,412, $219,538, $364,579. Figures of average annual product value, in the same periods, were: $38,228, $72,156, $77,314, $121,629, $166,876, $247,983. The remarkable increase in these averages from 1890 to 1905 cannot escape attention as showing the great development of the industry in this generation.

The thirteenth census report gave the number of establishments at the close of 1909 as seven hundred and seventy-seven, representing a capital invested of $409,348,-

505, an increase of $241,841,292 since 1899, with value of annual production $267,869,000, an increase of $140,542,000. There was a two per cent. gain in the number of establishments and a one hundred and ten per cent. gain in value of production. While there was a one hundred and forty-four per cent. increase in capital invested there was only slightly more than fifty-two per cent. increase in value of production. Wage earners were 75,978 and other employees, 5,495. New York had one hundred and seventy-eight establishments, Massachusetts eighty-eight, Pennsylvania seventy-two, Wisconsin fifty-seven, Connecticut fifty-one, Ohio forty-seven and Maine forty-five. Paper was made to the amount of 4,216,708 tons. News print in rolls amounted to 1,091,017 tons, value, $42,807,000, average cost $39.23½ per ton; news print at the mills then sold, in some instances, from $40 to $42 a ton. Book-paper plain amounted to 575,000 tons, value, $42,846,674, average cost, $74.44 per ton. Fine writing amounted to 169,125 tons, value, $24,966,102, average cost $147.72. Other figures were: manila wrapping, 73,731 tons, value, $6,989,436; heavy wrapping, 108,561 tons, value, $4,380,792; straw wrapping, 32,988 tons, value, $870,419; bogus manilla, 367,932 tons, value, $19,777,707; tissue, 77,745 tons, value, $8,553,654. The tonnage of ground-wood and chemical fibre produced in three years, was: 1899, 1,179,525; 1904, 1,921,768; 1909, 2,495,523.

In 1911 the report of the United States tariff board on pulp and news print paper gave eight hundred and ninety-four plants as making paper of some kind, their total productive capacity being 5,196,398 tons. Of that total news print and hangings were 1,335,321 tons, wrapping, 1,020,914 tons; board, 1,190,214 tons; book, 786,163 tons and writing, 210,617 tons. In the same report the number of ground-wood mills was given as one hundred and ninety-two; grinders, 1,485, producing annually 2,008,680 tons; sulphite plants, ninety, producing 1,204,894 tons; soda pulp plants, thirty-one, producing 417,387 tons. In the sulphite and soda plants there were 555 digesters.

A tabulation of the census of manufactures taken in 1914 was made public in September, 1916, and showed the

following for the industry of paper and pulp: establishments, seven hundred and eighteen; capital, $534,625,000; value of product, $332,147,000; wage earners and other employees, 95,156. Comparison with figures for 1909 and 1904 show a wonderful increase in capital invested and in tonnage and value of product in the several branches of the industry. From 1909 to 1914 the increase in capital was thirty per cent.; value of products, twenty-four per cent.; employees, seventeen per cent.; salaries and wages paid, thirty per cent. Comparative figures for 1904 and 1914 were as follows: roll-news. tons, 841,000 tons, value $32,763,000, and 1,186,277 tons, value $47,332,392; sheet news, value, $3,143,000 and $5,610,382; book-paper, 435,000 tons, value, $31,157,000, and 786,626 tons, value, $58,496,221; writing-paper, 132,000 tons, value, $19,321,000 and 195,351 tons, value, $28,637,257; other fine papers, 15,000 tons, value, $2,928,000, and 52,377 tons, value, $5,417,661; heavy wrapping, 97,000 tons, value, $4,036,000 and 98,780 tons, value, $3,588,357; straw-wrapping $54,000 tons, value, $1,389,000 and 15,606 tons, value, $519,309; wood-manillas. 228,000 tons, value, $10,100,000 and 383,987 tons, value, $17,975,630; boards of all kinds, 521,000 tons and 1,208,795 tons.

The news print branch of paper-manufacturing has been largely a development since the civil war. Before that period cheap paper was not possible in the absence of wood-pulp; and the enormous size and circulation of modern newspapers were unknown. About 1870 the daily production of news print amounted to one hundred and thirty tons, the maximum in any one mill being nearly ten tons. Since that time the daily ton product of all the mills of the country has been in successive years approximately as follows: 1880, four hundred; 1890, seven hundred; 1900, one thousand nine hundred; 1905, three thousand; 1909, four thousand; 1915, six thousand.

In 1907 agitation developed among newspaper publishers on account of the higher prices asked for newsprint. The government was appealed to for prosecution of the so-called "paper trust" and for the repeal of tariff duties on paper and pulp. President Roosevelt, in his

annual message, advocated the repeal of the duty on pulp provided an agreement could be secured with Canada that there should be no export duty on pulp-wood from that dominion. Nothing came from this immediately but, in 1910, consideration of a general trade reciprocity with Canada resulted in the appointment of commissioners of the two countries, who worked out a tentative agreement which, in January, 1911, was submitted to congress by President Taft.

In this agreement paper, pulp and pulp-wood were placed on the free list except when they came from countries that had placed an export duty on them. At that time pulp came into the United States free of duty or with countervailing duties; pulp-wood was free, and paper bore moderate duties. The reciprocity treaty passed congress and was signed by the president but it was rejected in the Canadian parliament. One section of the measure was so framed that even with the refusal of Canada to accept the treaty, as a whole, pulp, and paper valued at not over two and one-half cents per pound, were to come into this country free of duty. Thus our market was opened to all the pulp and paper producing countries of the world and especially to Canada by reason of her nearness and abundance of pulp-wood.

The immediate effect of this legislation was to injure the trade in the United States especially in sections contiguous to Canada and to encourage paper-manufacturing in that dominion. Depression in the United States prevailed until the European war of 1914-1916, in a measure, overcame the condition. Comparative figures of exports from Canada before and after this legislation demonstrate how it worked. In 1911, 1912, 1913, 1914, 1915, for the fiscal years ending March 31, exports from Canada to the United States were in value as follows:[288] All paper, $2,075,889, $2,086,304, $9,390,144, $10,616,753, $12,950,491; printing paper, $1,962,832, $1,989,863, $4,242,298, $9,818,539, $12,126,982; chemical wood pulp, $1,298,162, $1,585,-

[288] Dominion of Canada. *Session Papers,* Vol. 51, No. 7. *Report of the Department of Trade and Commerce for* 1915. Part III., pp. 195 and 199.

615, $1,995,817, $2,660,013, $4,550,196; mechanical wood pulp, $3,796,427, $2,834,329, $2,580,462, $2,253,621, $2,893,618; pulp wood, $6,092,715, $5,697,901, $6,806,945, $7,388,770, $6,817,311.

These yearly figures differ slightly from those in the United States reports for the reason that the United States fiscal years end June 30. During our fiscal year ending June, 1916, Canada exported $17,759,018 worth of paper to the United States. Exports of pulp-wood were valued at $6,102,170, all of which came to the United States, a decrease from 1915 of $360,955. Wood-pulp exports to the United States were to the value of $10,793,647. Imports of finished paper and the manufactures thereof from the United States were to the value of $4,243,530, and books, periodicals, etc., $4,076,671.

The Underwood-Simmons tariff bill of 1913 operated to repeal the section of the reciprocity act of 1911, that related to pulp and paper but the burdens that the American industry complained of were not removed. Free entry was given to printing-paper worth not more than two and one-half cents a pound and a tax of twelve cents *ad valorem* was placed on print-paper worth more than two and one-half cents. It was also provided that a countervailing duty should be placed upon printing-paper valued above two and one-half cents when imported from any country imposing export duty upon paper, wood-pulp or pulp-wood. On the free list were many raw materials including rags, pulp-wood and wood-pulp. Duties on chemicals, china-clay, starch and other articles were reduced. Most of the articles on the free list were also free under the Payne-Aldrich act of 1909; except news paper generally had a moderate protection although slightly reduced, from the tariff prevailing. Most duties were *ad valorem* and the insidious combination of specific and *ad valorem* was largely dropped. The revenue bill enacted in 1916 amended the tariff of 1913 by placing on the free list printing-paper of value up to five cents a pound with the duty of twelve per cent *ad valorem* applying to paper valued above that price.

During the first year of the great European war the

industry in this country was in disturbed condition. At the beginning everybody, apprehensive, was buying everything in sight, so that trade was booming. Then came the reaction to be expected and a general inactivity out of which normal conditions gradually returned. Foreign trade kept up for a time, but soon there was a dearth of raw materials, especially chemicals and colors. The supply of pulp was first abundant but eventually became scarce, with prices high. Rags went along the same road. All kinds of paper had a record, for the year, of up and down, settling finally into practically normal. In 1916 there was a marked change. Demand for paper, especially printing, increased, and, although mills were running at top-notch the market could not be fully supplied. Raw materials were scarcer and some were entirely non-procurable. This scarcity revived recollections of like conditions in the industry in its earlier years. History was repeating and, as then, so now the public was exhorted to help by saving rags and old paper. The United States secretary of the interior and the United States chamber of commerce sent out notices to be distributed urging attention to the needs of the paper-manufacturers and newspapers carried advertisements urging the saving of waste paper.

Throughout the summer the situation grew steadily worse, so far as shortage of paper was concerned. Newspapers were especially hard hit, finding it impossible to get paper according to their needs and even the government printing office in Washington feared that it would run short. Many newspapers cut down their size and the American Newspaper Publishers Association and the United States Federal Trade Commission urged publishers and other users of paper to practice rigid economies. It was freely predicted that, unless consumption could be reduced, or, that the war should come quickly to an end, so that paper-stock and chemicals could be again freely procured, the shortage would become more and more procured, the shortage would become more acute.

Prices went up. All paper was cheap in 1913 and 1914 but in 1916 all paper was high priced. For news, not under contract, almost any price could be got, three, four or

A Typical Modern Paper Mill.
The Oxford, in Rumford Falls, Me.

five cents or more a pound, while the prospect was that, for 1917, three to four cents would be the market figure and, perhaps, supply scarce at that. Book papers were eight cents a pound and more and still on the upward move. Ground-wood pulp, in September, was thirty to thirty-five dollars a ton and little to be had. With supplies from Scandinavia cut down bleached sulphite, which was $2.75 a hundred weight in 1915, was now $8.80, and unbleached $6.75. And the outlook was for higher prices.

Statistics are available in *Lockwood's Directory* showing the distribution of the industry in the different sections of the country in 1916, the character and variety of product, the equipment and capacity of the individual mills and other relative matter. Beginning in the far northeast, Maine was nearly evenly divided between paper-making and pulp-making. Its large forests made it an inviting region for the upbuilding of the wood-pulp industry and for the concentration of much making of news and other papers near the source of pulp supply. In the state there were thirty paper-mills and forty pulp-mills. The pulp-mills had a daily capacity of nearly 3,200 tons, of which a little more than four hundred tons was soda-fibre, over 1,500 tons ground-wood and the balance sulphite-fibre. The paper-mills produced news, book, writing, bond, ledger, board, manilla, kraft, wrapping, bag, and other varieties, their daily capacity being about 2,400 tons. Of this total, about one-half was news, the leading producers in this line being, the mills of the St. Croix Paper Company at Woodland; the International Paper Company at Orono and Chisholm; the Great Northern Paper Company at Millinocket and Madison; and the Pejepscot Paper Company at Brunswick and Lisbon Falls, which company had three paper-mills with daily capacity of three hundred and twenty tons of news and wrappers, and three pulp mills able to produce daily three hundred tons of ground-wood and seventy tons of sulphite-fibre. The book-paper production of the state, amounting daily to nearly four hundred and fifty tons, was almost entirely in the hands of the Oxford Paper Company at Rumford, and S. D. Warren & Co,, at Cumberland Mills, dividing

nearly half and half, while the Hollingsworth and Whitney Company, at Winslow and the Rumford Falls mill of the International Paper Company, one with two hundred and fifteen tons and the other with one hundred and ninety tons daily, divided most of the manilla business.

One of the historic mill sites was that occupied by the Warren plant in Gardiner. Francis Richards, before the

S. D. WARREN.

middle of the last century, operated the second mill in Gardiner and members of his family succeeded him as the Richards Paper Company in 1884 and after. The company also had pulp mills in South Gardiner and Skowhegan. Another Gardiner present-day mill, the Copsecook, had its beginning in the enterprise of the Great Falls Company in 1852 but its fame has been achieved by the firm of S. D. Warren & Co., by whom it was purchased about 1854. It is a small affair compared with the other S. D.

Warren plant, at Cumberland Mills, on the Presumpscot river, with its forty-five beating and nineteen refining engines, and twelve Fourdriners, daily capacity of two hundred tons of book and one hundred tons of soda fibre.

In New Hampshire precedence was maintained by the two mills of the Berlin Mills Company, the Riverside, daily capacity of fifty tons of kraft, and the Cascade, with two hundred and twenty-five tons of news and kraft; the Glen mill of Berlin, with over one hundred tons of news daily; the two mills of the Odell Manufacturing Company,

W. H. SHARP.

W. N. CALDWELL.

daily capacity of one hundred tons of bond, manilla bag and other papers; the Claremont, sixty tons manilla and wrapping and the Henry mill in Lincoln, eighty tons bond, envelope and manilla. The twenty-nine mills of the state had a total daily capacity of nine hundred tons. Nearly one-half the pulp of the state came from the Burgess Sulphite Fibre Company, in Berlin, which could produce four hundred and fifty tons of bleached sulphite-fibre every day. Next were the Berlin Mills Company, producing daily one hundred and fifty tons of ground-wood and one hundred and twenty tons of sulphite and then the Glen mill with daily capacity of eighty tons of ground-wood and sixty tons

of sulphite-fibre. The thirteen pulp mills of the state had a daily capacity of 1,100 tons, of which seven hundred and eighty was ground-wood.

Of the eighteen mills in Vermont one only was of much size, the Fall Mountain, of Bellows Falls, with daily capacity of eighty-two tons of news, manilla and specialties; the next largest was the Fitzdale mill of forty tons of news daily. The product of the other mills was hanging, manilla, kraft, tissue, blotting, boards and specialties, the total capacity of all being only a little more than three hundred and fifty tons a day. Eleven pulp-mills had a

A. W. ESLEECK.

GEORGE W. WHEELWRIGHT.

daily capacity of nearly four hundred tons, all but twenty-five tons being ground-wood.

In number of mills, quality, quantity and value of product Massachusetts still held its preeminent position. It was entirely a paper-manufacturing state having only five pulp mills with daily capacity of one hundred and eighteen tons. But its paper-mills were one hundred and eight. Most were making the higher grades of paper such as bond, ledger, linen, writing and book, although many of the smaller mills made board, hanging, tissue, manilla, roofing, sheathing, wrapping, kraft, blotting and other kinds. The

total daily capacity of all was over two thousand tons, the largest producers under one management being the mills of the American Writing Paper Company, daily capacity three hundred and fourteen tons. Then there were: the mill of Bird & Son, one hundred tons daily of roofing and wrapping; the eight mills of Crocker, Burbank & Co., two hundred tons daily of book, bristol and card; the mill of the Haverhill Box Board Company, one hundred and eighty tons daily of board; the mill of the Champion-International Company, one hundred tons daily of coated; the four mills of the Fitchburg Paper Company, seventy tons daily; the mill of the Nashua River Paper Company, seventy-five tons daily of book, bond and other varieties; the mill of the Chemical Paper Manufacturing Company, fifty tons daily of bond, linen, cover, writing papetrie and other fine papers; the three mills of the George W. Wheelwright Paper Company, fifty-seven tons of book, coating and bristol.

In Massachusetts the town of Milton no longer held the prestige which it had won as the first paper-making village in that state and the fifth in the United States. But descendants of those early active in the mills there were still identified with the industry. At the close of the eighteenth century Boies & Tileston there owned and operated both the upper and the lower mill, that of Boies & Clark, 1765, and that of Boies & McLean, 1771. Mark Hollingsworth, who was born in Delaware in 1777, came to Milton in 1798 and connected himself with Boies & Tileston. When Jeremiah S. Boies retired, about 1809, the firm became Tileston & Hollingsworth and the new owners enlarged and improved both mills. Mr. Hollingsworth, who was a trained paper-maker, was the manufacturer of the concern. He died in Milton in 1855. He was succeeded by his son, Amor Hollingsworth, who was born in 1808 and died in 1871 and the latter, in turn, was succeeded by his son, Amor L. Hollingsworth who was born in 1837 and died in 1907 and was president of Tileston & Hollingsworth when the concern was incorporated. Upon the death of Amor L. Hollingsworth, his son, Amor Hollingsworth, became president of the Tileston & Hol-

lingsworth Company. Thus for four generations and for more than one hundred years have the Hollingsworths been identified with paper-manufacturing in Massachusetts. Lineal descendants of Mark Hollingsworth and Daniel Vose, who was also early identified with the first Milton mills, are Z. T. Hollingsworth, V. Hollingsworth and Charles Vose who, as the Hollingsworth & Vose Company, have mills in East Walpole and West Groton.

Watertown, adjoining Newton, had a mill in 1839 operated by William May, that started a business which endured there for more than half a century. In the course of time Leonard Whitney, who had worked in the mill, acquired possession of the property, and, with his son, operated it. In 1862 E. A. Hollingsworth purchased an interest and the business was continued under the name

MARK HOLLINGSWORTH.

of Hollingsworth & Whitney, as a partnership and as a corporation. Mr. Whitney died in 1881 and Mr. Hollingsworth in 1882, but the business remained in the hands of their descendants. In 1884 and after, the concern continued to operate two manilla mills in Watertown and also had two manilla mills in Gardiner, Me., the Cobbossee and the Aroostook both which, in 1916, were owned and operated by the same corporation. The Cobbossee mill is on the site of a mill built in 1865.

There was one lone mill in Rhode Island, the Phillipsdale, equipped with a single machine for producing fifty tons of felt and sheathing every day.

Connecticut had forty-six paper mills and one pulp mill. Most of the mills were small and twenty-nine of them were situated in Hartford county where the business had its beginning before the revolution. The daily capacity of all the mills was about six hundred and fifty tons, the Thames River Specialties Company, in Montville, the New Haven Pulp and Board Company and the Uncas mill of the American Straw Board Company, in Norwich, each with daily capacity of one hundred tons; and the Windsor Locks mill of the American Writing Paper Company, daily capacity sixty-five tons, being the largest producers.

For more than half a century the name of Case was identified with the industry in this state and it was still most conspicuous in 1916. A. Wells Case and one of his brothers learned the trade in the old Bunce mills. At Highlands, in Manchester, they built a mill, in 1862, and during the next twelve years lost it three times by fire and once by a flood. Finally they built one in 1874 and another in 1884, and these endured into the next century. In 1916 the mill of the A. Willard Case Company was in Manchester, that of Case Brothers in South Manchester, that of the Case Manufacturing Company in Unionville, that of Case & Marshall in Burnside, with all which A. Willard Case, Lawrence W. Case and Raymond S. Case were interconnected. Then there was the mill of the Case & Risley Paper Company in Oneco and the Palisade mill of the Riverton Company—the only pulp-mill in the state—which made pulp for all the Case paper-mills.

New York had no near rival in number of mills or importance and value of product. Its one hundred and sixty-two paper-mills had a daily capacity of 4,636 tons of all kinds of paper. Twenty-three mills alone could produce nearly 2,000 tons, principally news. The several mills—paper and pulp—of the International Paper Company; the Knowlton, the Taggart and the Remington plants; the Saratoga county mills of the West Virginia Pulp and Paper Company; the mills of the Gould Paper Company; the mills of the St. Regis Paper Company; the Dexter

EDWIN R. REDHEAD.

JOHN F. KING.

Sulphite Pulp and Paper Company, and others; were impressive factors in maintaining the industry in the State at a high point of efficiency.

Foremost in capacity for news were the Glens Falls, one hundred and forty-two tons; the Finch Pruyn & Co. mill, one hundred and five tons; the Tidewater mill in Brooklyn, one hundred tons; the Niagara Falls, one hundred and fifty-nine tons; the Fort Edward mill, one hundred and thirty-three tons; the Hudson River mill at Palmer, two hundred and sixty-two tons; the De Grasse mill at Pyrites, one hundred and sixty tons, and the Woods Falls mill at Watertown, one hundred and seventeen tons. Next in line

were the thirty board mills, with daily capacity of about 1,200 tons. Most of these were small, producing less than fifty tons a day, but two were large, the mill of the Piermont Paper Company, one hundred and seventy-five tons daily and the mill of the Tonawanda Board and Paper Company, one hundred and fifty tons. And the mill of the Racquette River Paper Company of the Sisson family, with daily capacity of seventy tons of manilla envelope, express and parchment, was listed in the front ranks.

The Goulds, controlling the Gould Paper Company and

J. A. Outterson. B. B. Taggart.

the St. Regis Paper Company, became active and influential in paper-manufacturing in Jefferson and Lewis counties. Their St. Regis mills, in Deferiet, Black River and Herrings, had a daily capacity of one hundred and sixty tons of news, twenty tons of manilla, twenty tons of board, two hundred and forty tons of ground-wood, and one hundred and sixty tons of sulphite-fibre; the Gould mills, in Lyons Falls and Port Leyden, had one hundred and thirty-five tons of news and eighteen tons of manilla, with five pulp-mills equipped with twenty grinders for ground-wood and three digesters for sulphite. The St. Regis also owned

fifty-eight thousand acres of timber land for pulp purposes. In December, 1916, the Goulds sold their interests in this company to another group of wealthy financiers.

James A. Outterson became one of the biggest manufacturers in the Black River section at this time. He was president of the Carthage Sulphite Pulp and Paper Company, the Champion Paper Company, the West End Paper Company and the De Grasse Paper Company, his four plants having a daily capacity of nearly two hundred tons of news and boards, nearly one hundred tons of ground-wood and sixty tons of sulphite-fibre.

The famous Remington mills finally passed out of the Remington family possession. In 1915 a receiver was appointed for the property which, late in 1916, was sold to new owners, prominent among whom and holding a controlling interest, were Daniel R. Hanna and his sons.

The ninety-five pulp-mills of the state had a daily capacity of about 3,500 tons, of which 2,400 tons was ground-wood and nearly nine hundred tons sulphite-fibre. Most of this pulp was made by paper-mill companies for their own use, comparatively little being sold outside. There were eleven pulp-mills that manufactured for the market but their output was not large, about one hundred and fifty tons daily. The mills of largest capacity were in Cadyville, Corinth, Cohoes, Deferiet, Fort Edward, Glens Falls, Hudson Falls, Herrings, Hinckley, Lockport, Mechanicsville, Niagara Falls, Norfolk, Palmer and Watertown.

Expansion of paper-making at Niagara Falls, N. Y., began after 1850. Mills on Bath Island had been operated with more or less success from 1823, but no particular attention had been given to the utilization of the water-power there running to waste. In 1852 Stoughton Pettebone purchased a part interest in the Bath Island plant from L. C. Woodruff and work was carried on by the firm of Woodruff & Pettebone until 1883 when the firm was dissolved and the Pettebone Paper Company incorporated with Stoughton Pettebone, L. B. Pettebone, John Quigley and others as stockholders and officers. When Bath Island and adjacent property was taken by the state of New

York for a park reservation the Pettebone Paper Company, in 1884, built another mill on the banks of the hydraulic canal where it ever after continued. Prior to this there had been a pulp-mill on the river bank, built and operated by Hill & Murray but afterward owned by C. B. Gaskill, J. J. MacIntire and others, incorporated as the Cataract Manufacturing Company. In 1892 the Pettebone and the Cataract companies consolidated and formed the Pettebone-Cataract Company which was still in existence in 1916, running both the paper-mill and the pulp-mill.

One of the earliest promoters of pulp-making at Niagara Falls was John F. Quigley. In 1877 he built a pulp-mill and made about four tons a day. Eleven years later a paper-mill was added to the plant and Arthur C. Hastings, who had come from Rochester, was installed as manager. After a time the owners of the plant incorporated as the Cliff Paper Company and, in 1892, the business was sold by Mr. Quigley to J. F. Schoelkopf, Arthur Schoelkopf, Henry Grigg, W. D. Olmstead, George B. Matthews and Arthur C. Hastings, who gradually expanded the property into the establishment as it was existing in 1916.

Early in 1891 the Niagara Glazed Paper Company, promoted by Henry M. Robertson, C. B. Gaskill and others, came into existence, to make, principally, glazed, lithographic, label and coated papers and box boards. In 1896 the company was succeeded by the Niagara Surface Coating Company, of which John C. Tammerts was the principal owner, but that in time went out of existence. Another early mill in Niagara was that of Allan & Jones which, in 1880, was taken over by the Niagara Wood Paper Company with Walter Jones as manager, and machinery for making boards was then added.

In 1892 the Niagara Falls Paper Company was organized by Lewis A. Hall, J. L. Norton, D. O. Mills, J. C. Morgan and others and a plant was built that was then considered one of the most complete in the world. The company developed its own water-power, and had seven thousand two hundred water horse-power and two thousand three hundred steam horse-power. It installed one one hundred and thirty-seven-inch and five one hundred

and twenty-two-inch Fourdriniers and was able to turn out one hundred and twenty-five tons of news every twenty-four hours. In addition there was a sulphite mill of forty tons daily capacity and a ground-wood mill of sixty tons capacity. Twenty-five years after this starting the plant was still in as full and effective operation as when it began, the largest in production in Niagara Falls, and a part of the International Paper Company.

New Jersey had fallen largely into the line of board manufacturing. Of the forty-six mills in the state twenty-three were, in whole or in part, devoted to boards and out of a total of one thousand tons daily capacity nearly seven hundred were of boards. The remaining product of three hundred tons was mostly in manilla, felting, tissue, building and other varieties. No news and very little book was made. The largest plants were those of the McEwen Brothers, in Whippany, one hundred and ten tons of boards daily; the mill of the H. W. Johns-Manville Company, one hundred tons daily of asbestos and felt, and the two mills of the United Paperboard Company in Whippany, ninety tons daily.

Pennsylvania was the third state in number of mills and amount of product. It had seventy-one paper-mills with daily capacity of about 2,000 tons. Eleven mills had capacity of from fifty to one hundred and forty-five tons and one—the Philadelphia Paper Manufacturing Company—could make two hundred and eighty tons of board every day. The property of the New York and Pennsylvania Company, of which Colonel A. G. Paine was long the responsible and successful head, consisted of two large plants in this state, in addition to a mill in New York, where fifty tons of soda-fibre were daily produced. The Johnsonburg mill, with eight machines and a capacity of one hundred and forty-five tons a day of bond, book, envelope, writing and other varieties, had with it two pulp-mills, one of ninety tons daily capacity of soda-fibre and the other of seventy-five tons of bleached sulphite. The mill in Lock Haven, with six machines and daily capacity of seventy tons of book, writing, cover, hardware and other varieties, had a pulp-mill of sixty-two tons soda-fibre daily.

The mill of the Hammermill Paper Company, in Erie, ranked among the foremost establishments in the country in the production of bond, ledger, superfine and writing. It was equipped with five Fourdriniers and had a daily capacity of one hundred tons. Another notable mill was the Delaware of the Dill & Collins Company, in Philadelphia, with five Fourdriniers and a capacity of forty tons daily of book and coated, and an accompanying pulp-mill for making twenty-three tons of soda-fibre daily. Other large establishments with their daily capacities were: the Bayless Manufacturing Corporation, seventy tons of bag and kraft; the Frank P. Miller Paper Company, one hun-

AUGUSTUS G. PAINE.

dred tons of boards; the H. F. Watson Company, one hundred and twelve tons of felt and building; the John Long Paper Company, eighty tons of roofing; the Nixon Flat Rock mills, sixty-two tons of book; the West Virginia Pulp and Paper Company's two mills, one hundred tons of book, writing and other fine papers; the York Haven Paper Company, seventy tons of fibre and express papers. Nearly one-third of the product of the state was book, writing, bond, ledger, linen, lithograph, and other papers in that class.

Pennsylvania's fifteen pulp-mills had a daily capacity of seven hundred tons, of which fully six hundred and eighty-five tons were soda and sulphite-fibre, each about one-half. Among the largest pulp-mills were those of the York Haven Paper Company, the West Virginia Pulp and Paper Company and the Bayless Manufacturing Company.

In Delaware the plant of the Jessup & Moore Paper Company preserved the traditions of Wilmington on the Brandywine as a paper-manufacturing locality from the time of the famous Gilpin mill there before 1800. The two mills—the Augustine and the Rockland—had a daily capacity of over sixty tons of book, while the Delaware pulp-mills furnished a like quantity of soda-fibre.

There has always been one solitary mill in the District of Columbia. Succeeding to that distinction, the District of Columbia Paper Manufacturing Company was making twenty-five tons a day of blotting, cover, book and specialties in 1916.

Maryland became a more important paper-manufacturing state after the civil war. In 1886 twenty-nine mills were in operation, in Bentley Springs, Chestertown, Conowingo, Easton, Elkton, Ellicott City, Fairhill, Freeland, Grove Run, Hagerstown, Hoffmanville, Houcksville, Manchester, Morgan, Parkton, Reisterstown, Rising Sun and White Hall. Few of these mills were of much importance. The largest were: that of the Susquehanna Water Power and Paper Company in Conowingo, daily capacity, twelve tons book and news; *The Public Ledger* mills of George W. Childs in Elkton, daily capacity, four tons of news; the Providence Paper Mills of William M.

Singerly in Fairhill, daily capacity, ten tons of news; the Chestertown mill, daily capacity, six tons of straw board; the Talbot County mill in Easton, daily capacity, six tons of straw board, and the Woodbine in Morgan, daily capacity, five tons of straw wrapping. Fully one half the product of all the mills in the State was straw wrapping. Several of these mills lasted into the twentieth century: those of the Youngs in Bentley Springs, the Chestertown straw-board mill, the Antietam in Hagerstown and the Gunpowder in Parkton. In 1916 there were in Asbestos, Baltimore, Bentley Springs, Chestertown, Childs, Elkton, Freeland, Hagerstown, Luke, Parkton, Providence, Rowlandville and White Hall, thirteen paper mills and two pulp mills. The product was asbestos, felt, carpet-lining straw and other boards, straw and other wrapping, hanging,

BLOOMFIELD H. MOORE

manilla, book, writing and roofing. The total daily capacity was one hundred and eighty-two tons of book, one hundred and sixty-two tons of other papers and one hundred and fifteen tons of soda fibre. Of this total, one hundred and thirty-seven tons of book, writing and other paper and seventy tons of soda fibre were the output of the West Virginia Pulp and Paper Company in Luke. Next in quantity of product was the Baltimore Roofing and Asbestos Company with forty tons of asbestos paper and twenty-five tons of wool felt daily. The Jessup & Moore Company turned out daily forty-five tons of soda fibre from the Radnor pulp mill in Elkton and from their Kenmore mill forty tons daily of book and writing.

In Virginia there were ten paper-mills, five pulp-mills and one combined pulp and paper-mill. The paper-mills were capable of producing three hundred tons daily, of which the mill of the West Virginia Pulp and Paper Company, at Covington, was credited with ninety-five tons of book and lithograph and the Bedford Pulp and Paper Company, at Big Island, with seventy-five tons of ticket paper. The pulp-mills could produce two hundred and twenty-six tons daily, the West Virginia Company making one hundred and twenty tons sulphite, the Bedford Company thirty-nine tons of ground wood and the Columbian Paper Company sixty-seven tons of soda fibre. In West Virginia, in 1875, mills existed in Halltown, Shepardstown, Wellsburg and Wheeling, but, in 1916, the five paper-mills and five pulp-mills were in Davis, Halltown, Harper's Ferry, Parsons, Richwood and Wellsburg. The daily capacity of the paper-mills was one hundred and twenty-five tons of board, bag and specialties and of the pulp-mills one hundred and thirty-five tons of sulphite-fibre and forty-eight tons of ground-wood. The leaders were the Parsons Pulp and Paper Company, with sixty tons of sulphite-fibre daily and the West Virginia Pulp and Paper Company, with forty-five tons of sulphite-fibre.

After the civil war paper-manufacturing was tentatively resumed in the south. About 1870 there were several Georgia mills in Savannah, Atlanta, Athens, Conyers and Newnan and one on Soap's creek near Atlanta. Either by

fire or by bad luck all, except two, soon went out of existence. In those days news sold for fourteen cents a pound and there was a profit on it of about four cents a pound. Saxe Anderson bought the mill on Soap's creek, added a pulp-mill and improved the plant; this was the beginning of the Marietta Pulp Company. About 1895 the same company bought an old mill in Atlanta and converted it into a mill for making paper.

When the twentieth century opened mills in the far southern States were: the Stevenson pulp, Stevenson,

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Ala.; the Pensacola, Pensacola, Fla.; the Fulton, Atlanta, Ga.; the Conyers, Conyers, Ga.; the Marietta, Marietta, Ga.; the Sewall, Whitesburg, Ga.; the Fall City, Louisville, Ky.; the Wheeling, Wheeling, Mo.; the Carolina, Hartsville, S. C.; the Chattanooga Pulp, Chattanooga, Tenn.; the Stone Fort, Manchester, Tenn.; the Tennessee Fibre, Memphis, Tenn.; the Oak Cliff and the Cumberland, Sugarland, Texas. In conjunction with these paper mills there were five ground-wood pulp mills and three sulphite mills. The total daily output of all these establishments was insignificant. It amounted to twenty-six thousand pounds of ground-wood pulp, thirty-four thousand pounds

of sulphite pulp, twenty-four thousand pounds of cotton kull fibre, fifty-nine thousand pounds of manilla, thirty thousand pounds of book, two thousand two hundred pounds of straw board, eight thousand pounds of straw board and sixty-two thousand pounds of book, news, hardware, straw, roofing and manilla wrapping.

By 1916 Alabama, Florida, Kentucky and Missouri were no longer paper-manufacturing States. In South Carolina the Carolina mill remained; in Tennessee, the Tennessee Fibre and the Kingsport Pulp; in Texas, the Oak Cliff; in Georgia the Pyntree, Kennesaw and Lawrenceville in place of those of 1900. North Carolina, Louisiana and Mississippi were new paper-manufacturing States. In North Carolina were the Champion Fibre Company in Canton, with daily capacity of 28,000 pounds of boards, 250,000 pounds of soda fibre and 250,000 pounds of sulphite fibre; the Halifax and the Roanoke Fibre Board in Roanoke Rapids, producing boards, sulphate fibre and ground wood. In Mississippi were the paper division of the Great Southern Lumber Company and the Louisiana Fibre Company both in Bogelusa and both producing container lining and sulphate pulp. Also in Louisiana, in Braithwaite, was the idle ground-wood mill of the Colonial Paper Company and the paper mill and sulphite mill of the E. Z. Opener Bag Company.

Wisconsin from late beginnings turned into the twentieth century as one of the leading states in the industry. With its fifty paper-mills in 1916 it ranked only after New York, Massachusetts and Pennsylvania and with its forty-seven pulp-mills was next after New York. The mills produced all kinds of paper, news, book, writing, bond, wrapping, tissue, manila, kraft, parchment, hanging, boards and specialties. Their daily capacity was 1,900 tons. The pulp-mills had a daily capacity of 1,000 tons of ground-wood, eight hundred tons of sulphite-fibre and one hundred tons of sulphate-fibre.

Foremost among the Wisconsin concerns was that of the Kimberly-Clark Company, the outgrowth of the energy and business foresight of J. A. Kimberly and Charles Clark. From 1872 until his death, in 1891, Mr. Clark

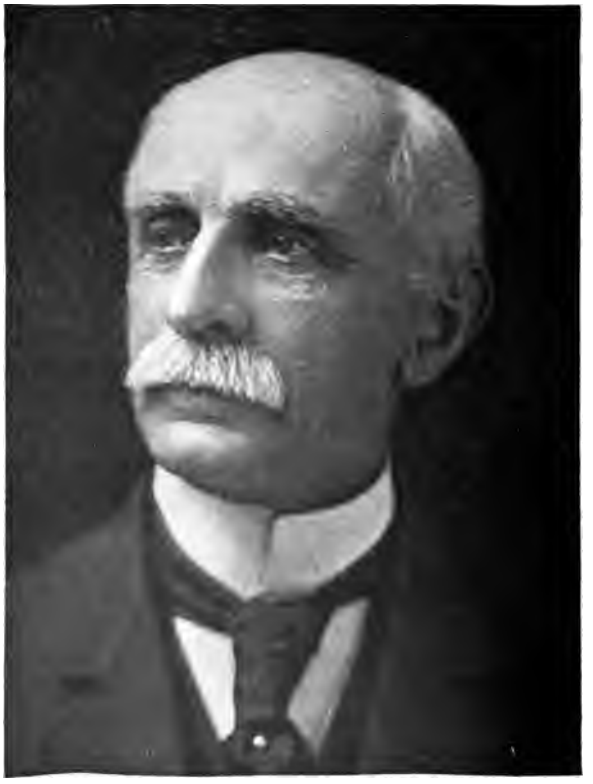
was a conspicuous figure in Wisconsin paper-manufacturing. The company was incorporated in 1907, with J. A. Kimberly as president. Its properties in Appleton, Kimberly, Neenah and Niagara were seven paper-mills with daily capacity of about two hundred and seventy tons and three pulp-mills with daily capacity of nearly two hundred tons. Other notable Wisconsin concerns that contributed much to the record of the state in the making of paper and pulp were the Riverdale Fibre and Paper Company of Appleton; the Thilmany Pulp and Paper Company, with mills in Appleton and Kaukauna; the Menasha Paper Company, with pulp and paper-mills in Ashland and Ladysmith, producing daily fifty tons of paper and one hundred and twenty?five tons of ground-wood and sulphite; the Nekoosa-Edwards Paper Company, producing daily one hundred and sixty tons of paper, eighty tons of ground-wood and one hundred and fifteen tons of sulphite-fibre; the Marathon Paper Mills Company of Wausau, with daily capacity of seventy-five tons of paper, twenty tons of ground-wood and one hundred and thirty-five tons of sulphite.

Forty-eight paper mills in Michigan had a daily capacity of nearly 2,000 tons and nine pulp mills, three hundred and fifty tons, all but one hundred tons being sulphite and sulphate-fibre. The character of product covered the widest range, from news, book, writing and bond to board, wrapping, manilla and many specialties. Among the big plants were the fourteen mills of the Bryant Paper Company, two hundred and fifty tons daily, of book, magazine and other high grade papers; the two mills of the Bardeen Paper Company, sixty tons daily of book, writing, wrapping, etc.; the two mills of the Eddy Paper Company, one hundred tons daily, mostly in boards and cards; the Grand Rapids mill of the American Box Board Company, one hundred tons daily; the mill of the Boehme & Rauch Company, one hundred and fifty-seven tons daily, paper boxes and containers; the mill of the River Raisin Paper Company, one hundred and twenty-five tons of boards; the MacSim Bar Paper Company, one hundred and ten tons, book and boards. Kalamazoo was the paper-

manufacturing center. Thirteen mills were there and their capacity was more than a quarter of that of the entire state.

Minnesota's nine paper-mills had a daily capacity of six hundred and fifty tons and her nine pulp-mills, six hundred and twenty-five tons. Of the paper most was news and book to the amount of about four hundred and seventy tons of which the two mills of the Northwest Paper Company had one hundred and five tons; the big mill of the Minnesota & Ontario Power Company, two hundred and twenty-five tons and the mill of the Watab Pulp and Paper Company, ninety tons. The Waldorf Box Board Company added one hundred and twenty tons of board daily.

In Ohio, with fifty paper-mills, eleven were run on bond,



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ledger, linen, writing, book and other fine papers, their daily capacity being about six hundred and twenty tons. The largest producer in this class was the Champion Coated Paper Company of Hamilton, with ten machines and daily capacity of two hundred and sixty-two tons. Then came the Miami Paper Company, one hundred tons and the two mills of the Mead Pulp and Paper Company, one hundred tons. Other mills of this kind were small, producing from ten to thirty tons daily. News was made in one mill only and there it divided, with book, fifteen

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tons a day. Mills, devoted, either wholly or in part, to board and wrapping, were twenty-four in number, producing daily six hundred tons. Of these only seven were of much size: The Lockland of the Richardson Paper Company, one hundred and fifty tons; the Hartje, in Steubenville, one hundred tons; the mill of the Ohio Box Board Company, in Rittman, one hundred and ten tons; the two Gardner mills in Middletown, one hundred and sixty-five tons; the three mills of the Fox Paper Company, seventy-five tons. The three active mills of the American Straw Board Company had a daily capacity of

one hundred tons. The total productive capacity of all the paper mills in the state was 2,000 tons a day, while the three pulp-mills could produce forty-four tons. Nearly one half the mills of the state were in the Miami valley, in Dayton, Franklin, Middletown, Hamilton and other places.

Illinois found its vogue mostly in straw, fibre and other boards. Of the twenty-nine mills in the state nineteen were devoted, in whole or in large part, to that kind of paper, their combined daily capacity being over nine hundred tons. In other lines, principally roofing, sheathing, wrapping, bag and manilla the daily capacity of the other mills was about two hundred and fifty tons. Like its neighbor, Indiana also found advantage in making various kinds of boards, seventeen of its mills having daily capacity in that line of a little more than two hundred tons, while the others, given over principally to wrapping, straw for corrugating, parchment and specialties, produced about two hundred and fifty tons daily. Book, news and writing was made in two mills. The four mills in Iowa were for roofing, wrapping and board, their daily capacity being nearly eighty tons. Kansas likewise, with four mills, produced only board, building and straw corrugated paper.

Of six mills in California one only produced news, while from that and the others came manilla, tissue, wrapping, boards, bristol, sheathing, felts and other varieties. The daily capacity of the six was 514,000 pounds. The Crown Willamette Paper Company, of which Wm. Pierce Johnson was president, had the news and tissue producing mill, and in connection therewith were pulp mills with daily capacity of 40,000 pounds of ground-wood fibre and 50,000 of sulphite fibre. The largest producers were the California Paper and Board mills, 200,000 pounds daily, and the Southern Board and Paper Mills, 110,000 pounds daily. Also on the Pacific coast in 1916 were other enterprises of the Crown Willamette Paper Company. These were three paper-mills and eight pulp-mills with daily capacity of 400,000 pounds of news, 110,000 pounds of manilla, wrapping, etc., 220,000 pounds of ground-wood and 180,000 pounds of sulphite fibre; and, in Washington,

one paper-mill with daily capacity of 360,000 pounds of news, manilla, etc., and one pulp mill with daily capacity of 140,000 pounds of ground-wood and 175,000 pounds of sulphite fibre. With the two paper mills and the two pulp mills of the Hawley Pulp and Paper Company in Oregon and in Washington, the Everett, the Inland Empire and the Northern Board paper-mills and the Everett soda-fibre mill the Pacific coast was well provided.

This broad review of the industry in 1916 may here fittingly bring its history to a conclusion. It has been a long way to travel, and the changes in the two hundred and twenty-five years that have been passed in retrospect, have been many and of surpassing interest. Altogether there is an amazing comparison between the solitary Rit-

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tenhouse mill of 1690, worth a few hundred dollars, employing three men, producing annually, perhaps, fifteen hundred reams of paper and supplying only the needs of a small community and, at the other end of the line, the great business of the twentieth century. The first mills made little else than news, book and writing paper, fullers' press-boards and bonnet-boards, and those in limited quantities. The mills in the United States in 1916 made two hundred and fifty different kinds of papers, while the articles manufactured from paper as their raw material numbered several hundred. The seven hundred establishments of 1916, with paper and pulp mills, represented an investment in capital of more than $550,000,000; employed 100,000 persons; afforded business opportunities to thousands of others in the handling of their product; were the main support of hundreds of other enterprises manufacturing machinery and supplying raw materials; had a daily capacity of about 20,000 tons of paper, and annually produced to the value of nearly $350,000,000.

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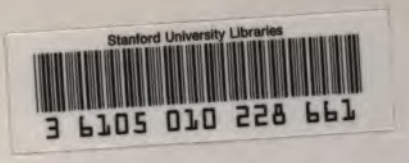

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